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WATER POLLUTION SURVEILLANCE SYSTEM. VOLUME 6. UPPER MISSISSIPPI RIVER BASIN

Public Health Service
Washington, D. C.

30 September 1963

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UPPER MISSISSIPPI
RIVER BASIN

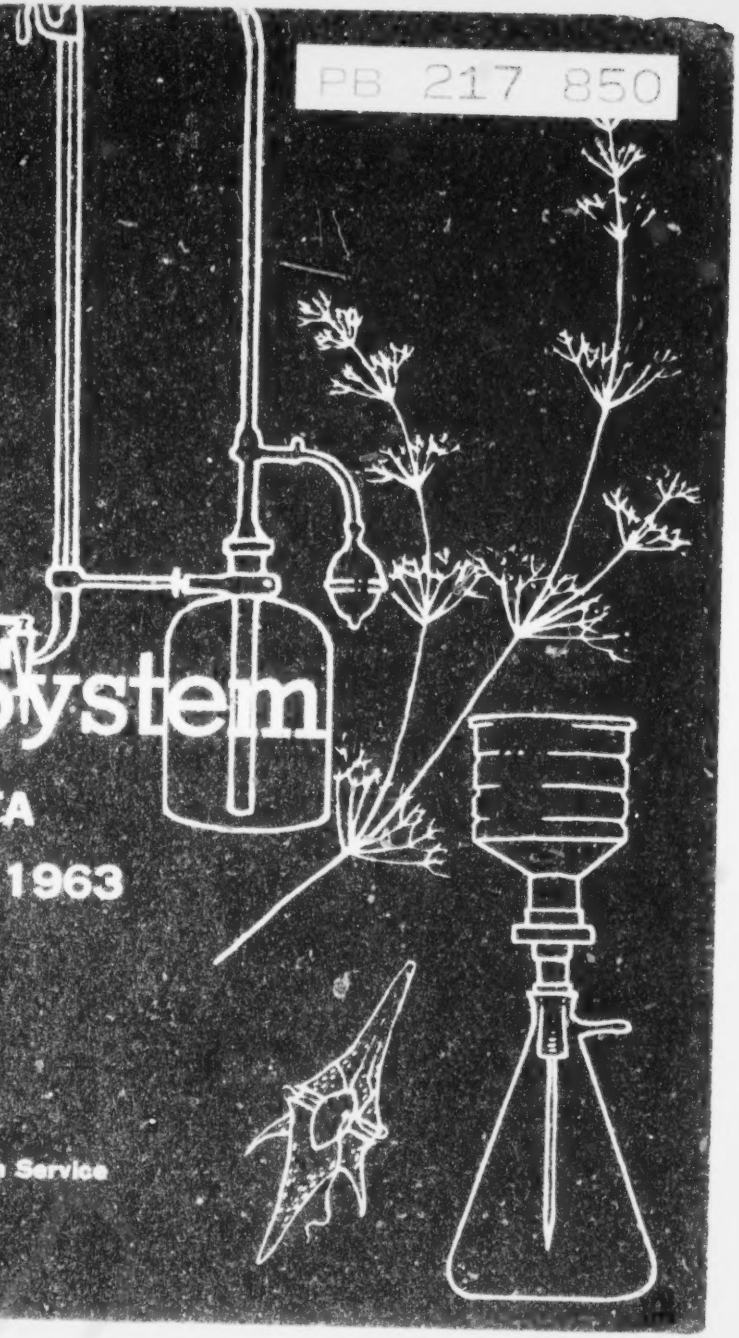
volume 6

PUBLIC HEALTH SERVICE

Water Pollution Surveillance System

ANNUAL COMPILATION OF DATA

October 1, 1962 • September 30, 1963



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE • Public Health Service

UPPER MISSISSIPPI RIVER BASIN
Volume 6

Public Health Service
Water Pollution Surveillance System

ANNUAL COMPILATION OF DATA
October 1, 1962 - - - September 30, 1963

A Federal, State and Local cooperative report on water pollution surveillance of surface waters at selected locations throughout the United States

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service, Division of Water Supply and Pollution Control
Washington, D.C. 20201

I

RELATED PUBLICATIONS:

National Water Quality Network
Annual Compilation of Data, October 1, 1957–September 30, 1958
Public Health Service Publication No. 663 (1958 Edition)

National Water Quality Network
Statistical Summary of Selected Data, October 1, 1957–September 30, 1958
Public Health Service Publication No. 663—Supplement 1

National Water Quality Network
Annual Compilation of Data, October 1, 1958–September 30, 1959
Public Health Service Publication No. 663 (1959 Edition)

National Water Quality Network
Annual Compilation of Data, October 1, 1959–September 30, 1960
Public Health Service Publication No. 663 (1960 Edition)

National Water Quality Network
Plankton Population Dynamics, July 1, 1959–June 30, 1961
Public Health Service Publication No. 663—Supplement 2

National Water Quality Network
Annual Compilation of Data, October 1, 1960–September 30, 1961
Public Health Service Publication No. 663 (1961 Edition)

National Water Quality Network
Annual Compilation of Data, October 1, 1961–September 30, 1962
Public Health Service Publication No. 663 (1962 Edition)

ACKNOWLEDGMENT

To increase the usefulness of the water quality data, annual compilations since 1958, including this one, have presented preliminary and unadjusted flow data for gaging stations at or near most of the Public Health Service Water Pollution Surveillance System sampling points. Final data may be obtained directly from the agency concerned. Any studies using the provisional flow data herein compiled should verify the data prior to completion of reports on such studies. For making the flow information available for this publication, grateful acknowledgment is made by the Public Health Service to:

The International Boundary and Water Commission,
United States and Mexico

The International Joint Commission, United States and Canada

The U.S. Department of the Interior
Bureau of Reclamation • Geological Survey

The U.S. Department of the Army
Corps of Engineers • Lake Survey

FOREWORD

This is the sixth annual compilation of data from the Public Health Service Water Pollution Surveillance System (formerly the National Water Quality Network). During this year, the System was increased from 122 to 128 stations. In order to provide data in a form more useful for local or regional water pollution control officials and their staffs, the present compilation is published in 11 separate volumes. The surveillance data reported herein reveal additional findings on pesticides and other organic chemicals in surface waters and on trends in radioactivity and other areas.

The Public Health Service gratefully acknowledges the assistance to our Surveillance System of the participating local, State and Federal Government agencies and private industry. The success of this program depends, in a large measure, upon their continued interest and support.

GORDON E. MCCALLUM, D. Sc.,
Assistant Surgeon General,
Chief, Division of Water Supply and Pollution Control

VOLUME 1

Northeast Basin

CONNECTICUT RIVER
at Enfield Dam, Conn.
below Northfield, Mass.
at Wilder, Vt.

HUDSON RIVER
below Poughkeepsie, N.Y.

LAKE ERIE
at Buffalo, N.Y.

MERRIMACK RIVER
above Lowell, Mass.

RARITAN RIVER
at Perth Amboy, N.J.

ST. LAWRENCE RIVER
at Massena, N.Y.

VOLUME 2

North Atlantic Basin

DELAWARE RIVER
at Philadelphia, Pa.
at Trenton, N.J.
at Martins Creek, Pa.

POTOMAC RIVER
at Washington, D.C.
at Great Falls, Md.
at Williamsport, Md.

SCHUYLKILL RIVER
at Philadelphia, Pa.

SHENANDOAH RIVER
at Berryville, Va.

SUSQUEHANNA RIVER
at Conowingo, Md.
at Sayre, Pa.

VOLUME 3

Southeast Basin

APALACHICOLA RIVER
at Chattahoochee, Fla.

CHATTAHOOCHEE RIVER
at Columbus, Ga.
at Lanett, Ala.
at Atlanta, Ga.

ESCAMBIA RIVER
at Century, Fla.

ROANOKE RIVER
at John H. Kerr Dam and
Reservoir, Va.

SAVANNAH RIVER
at Port Wentworth, Ga.
at North Augusta, S.C.

TOMBIGBEE RIVER
below Columbus, Miss.

VOLUME 4

Western Great Lakes and Lake Erie Basins

WESTERN GREAT LAKES

DETROIT RIVER
at Detroit, Mich.

LAKE MICHIGAN
at Gary, Ind.
at Milwaukee, Wis.

LAKE SUPERIOR
at Duluth, Minn.

ST. CLAIR RIVER
at Port Huron, Mich.

ST. MARYS RIVER
at Sault Ste. Marie, Mich.

LAKE ERIE BASIN

CUYAHOGA RIVER
at Cleveland, Ohio

MAUMEE RIVER
at Toledo, Ohio

VOLUME 5

Ohio and Tennessee River Basins

OHIO RIVER BASIN

ALLEGHENY RIVER
at Pittsburgh, Pa.

CUMBERLAND RIVER
at Clarksville, Tenn.

KANAWHA RIVER
at Winfield Dam, W. Va.

LITTLE MIAMI RIVER
at Cincinnati, Ohio

MONONGAHELA RIVER
at Pittsburgh, Pa.

OHIO RIVER
at Cairo, Ill.
at Evansville, Ind.
at Louisville, Ky.
at Cincinnati, Ohio
at Huntington, W. Va.
below Addison, Ohio
at Toronto, Ohio

WABASH RIVER
at New Harmony, Ind.

TENNESSEE RIVER BASIN

CLINCH RIVER
above Kingston, Tenn.
at Clinton, Tenn.

TENNESSEE RIVER
at Pickwick Landing, Tenn.
at Bridgeport, Ala.
at Chattanooga, Tenn.
at Lenoir City, Tenn.

VOLUME 6

Upper Mississippi River Basin

ILLINOIS RIVER
near Grafton, Ill.
at Peoria, Ill.

MISSISSIPPI RIVER
at Cape Girardeau, Mo.
at East St. Louis, Ill.
at Burlington, Iowa
at Dubuque, Iowa
at Lock and Dam 3 below St. Paul, Minn.

RAINY RIVER
at Baudette, Minn.
at International Falls, Minn.

RED RIVER (NORTH)
at Grand Forks, N. Dak.

VOLUME 7

Missouri River Basin

BIG HORN RIVER
at Hardin, Mont.

BIG SIOUX RIVER
below Sioux Falls, S. Dak.

KANSAS RIVER
at DeSoto Kans.

MISSOURI RIVER
at St. Louis, Mo.
at Missouri City, Mo.
at Kansas City, Kans.
at St. Joseph, Mo.
at Omaha, Nebr.
at Yankton, S. Dak.
at Bismarck, N. Dak.
at Williston, N. Dak.

NORTH PLATTE RIVER
above Henry, Nebr.

PLATTE RIVER
above Plattsmouth, Nebr.

SOUTH PLATTE RIVER
at Julesburg, Colo.

YELLOWSTONE RIVER
near Sidney, Mont.

VOLUME 8

Southwest-Lower Mississippi River Basin

ARKANSAS RIVER
at Pendleton Ferry, Ark.
at Little Rock, Ark.
near Forth Smith, Ark.
near Ponca City, Okla.
at Coolidge, Kans.

MISSISSIPPI RIVER
at New Orleans, La.
at Delta, La.
at Vicksburg, Miss.
at West Memphis, Ark.

OUACHITA RIVER
at Bastrop, La.

RED RIVER (SOUTH)
at Alexandria, La.
at Bossier City, La.
at Index, Ark.
at Denison, Tex.

VERDIGRIS RIVER
at Nowata, Okla.

VOLUME 9

Colorado River and Western Gulf Basins

COLORADO RIVER BASIN

ANIMAS RIVER
at Cedar Hill, N. Mex.

COLORADO RIVER
at Yuma, Ariz.
above Parker Dam, Ariz.-Calif.
near Boulder City, Nev.
at Page, Ariz.
at Loma, Colo.

GREEN RIVER
at Dutch John, Utah

SAN JUAN RIVER
at Shiprock, New Mex.

WESTERN GULF BASIN

RIO GRANDE
at Brownsville, Tex.
at Laredo, Tex.
at El Paso, Tex.
below Alamosa, Colo.

SABINE RIVER
near Ruliff, Tex.

VOLUME 10

Pacific Northwest and Alaska Basins

PACIFIC NORTHWEST

CLEARWATER RIVER
at Lewiston, Idaho

COLUMBIA RIVER
at Clatskanie, Oreg.
at Bonneville, Oreg.
at McNary Dam, Oreg.
at Pasco, Wash.
at Wenatchee, Wash.
at Northport, Wash.

PEND OREILLE RIVER
at Albeni Falls Dam, Idaho

SNAKE RIVER
at Ice Harbor Dam, Wash.
at Wawawai, Wash.
at Payette, Idaho

SPOKANE RIVER
at Post Falls Dam, Idaho

WILLAMETTE RIVER
at Portland, Oreg.

YAKIMA RIVER
at Richland, Wash.

ALASKA BASIN

CHENA RIVER
at Fairbanks, Alaska

SHIP CREEK
at Anchorage, Alaska

VOLUME 11
California and the Great Basins

CALIFORNIA BASIN

KLAMATH RIVER
near Keno, Oreg.

SACRAMENTO RIVER
at Greens Landing above Courtland, Calif.

SAN JOAQUIN RIVER
near Vernalis, Calif.

GREAT BASIN

BEAR RIVER
above Preston, Idaho

TRUCKEE RIVER
at Calif.-Nev. Border
at Farad, Calif.

CONTENTS

	Page
FOREWORD	iii
ACKNOWLEDGMENT	iii
PUBLIC HEALTH SERVICE WATER POLLUTION SURVEILLANCE SYSTEM	1
MAP OF SYSTEM SAMPLING STATIONS	2
ANALYTICAL METHODS AND RELIABILITY OF DATA	4
WATER POLLUTION PARAMETERS	5
Radioactivity	5
Plankton Populations	6
Organic Chemicals	7
Chemical, Physical, and Bacteriological Examinations	10
Trace Elements and Other Determinations	11
The Benthos	12
Fish Populations	13
STREAM FLOW	14
BIBLIOGRAPHY	15
EXPLANATION OF ANALYTICAL DATA	17
BASIN DESCRIPTION (Upper Mississippi River)	23
MAP OF BASIN SAMPLING STATIONS (Upper Mississippi River)	23
ANALYTICAL AND FLOW DATA. (*See* Station Index)	viii

ANALYTICAL AND FLOW DATA INDEX

STATION	General Description Trace Elements, Strontium 90	Radioactivity Determinations	Plankton Population	Organic Chemicals	Chemical, Physical and Bacteriological Analyses	Flow Data
	Page No.	Page No.	Page No.	Page No.	Page No.	Page No.
Illinois River						
near Grafton, Ill	25–26	27	28–29	30	31	32
at Peoria, Ill	33–34	35	36–37	38	39	40
Mississippi River						
at Cape Girardeau, Mo	41–42	43	44–45	46	47–48	49
at East St. Louis, Ill	51–52	53	54–55	56	57–58	59
at Burlington, Iowa	61–62	63	64–65	66	—	67
at Dubuque, Iowa	69–70	71	72–73	74	75	76
at Lock and Dam 3 below St. Paul, Minn	77–78	79	80–81	82	83–84	85
Rainy River						
at Baudette, Minn	87–88	89	90–91	92	93	94
at International Falls, Minn	95–96	97	98–99	100	101–102	103
Red River (North)						
at Grand Forks, N. Dak	105–106	107	108–109	110	111	112

Dash (—) indicates no determination made.

THE PUBLIC HEALTH SERVICE

Water Pollution Surveillance System

The Public Health Service program for providing fundamental information on the quality of the Nation's waters stems from Public Law 660, approved July 9, 1956, as amended by Public Law 87-88, July 20, 1961. Section 4(c) thereof states: ". . . the Secretary (of Health, Education, and Welfare) shall in cooperation with other Federal, State, and local agencies having related responsibilities, collect and disseminate basic data on chemical, physical, and biological water quality insofar as such data or other information relate to water pollution and the prevention and control thereof."

To fulfill this responsibility, the Public Health Service Water Pollution Surveillance System collects, interprets, and disseminates:

a. Information on changes in water quality at key points in river systems, as such quality may be affected by changes in water use and development.

b. Continuous information on the nature and extent of pollutants affecting water quality.

c. Data which will be useful in the development of comprehensive water resources programs.

d. Data which will assist State, interstate, and other agencies in their water pollution control programs, and in the selection of sites for legitimate water uses.

Some 50 sampling stations were established when the program started, October 1, 1957. By September 30, 1963, the number had grown to 128.

Each sampling location satisfies one or more of the following criteria:

a. Major waterways used for public water supply, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses.

b. Interstate, coastal, and international boundary waters.

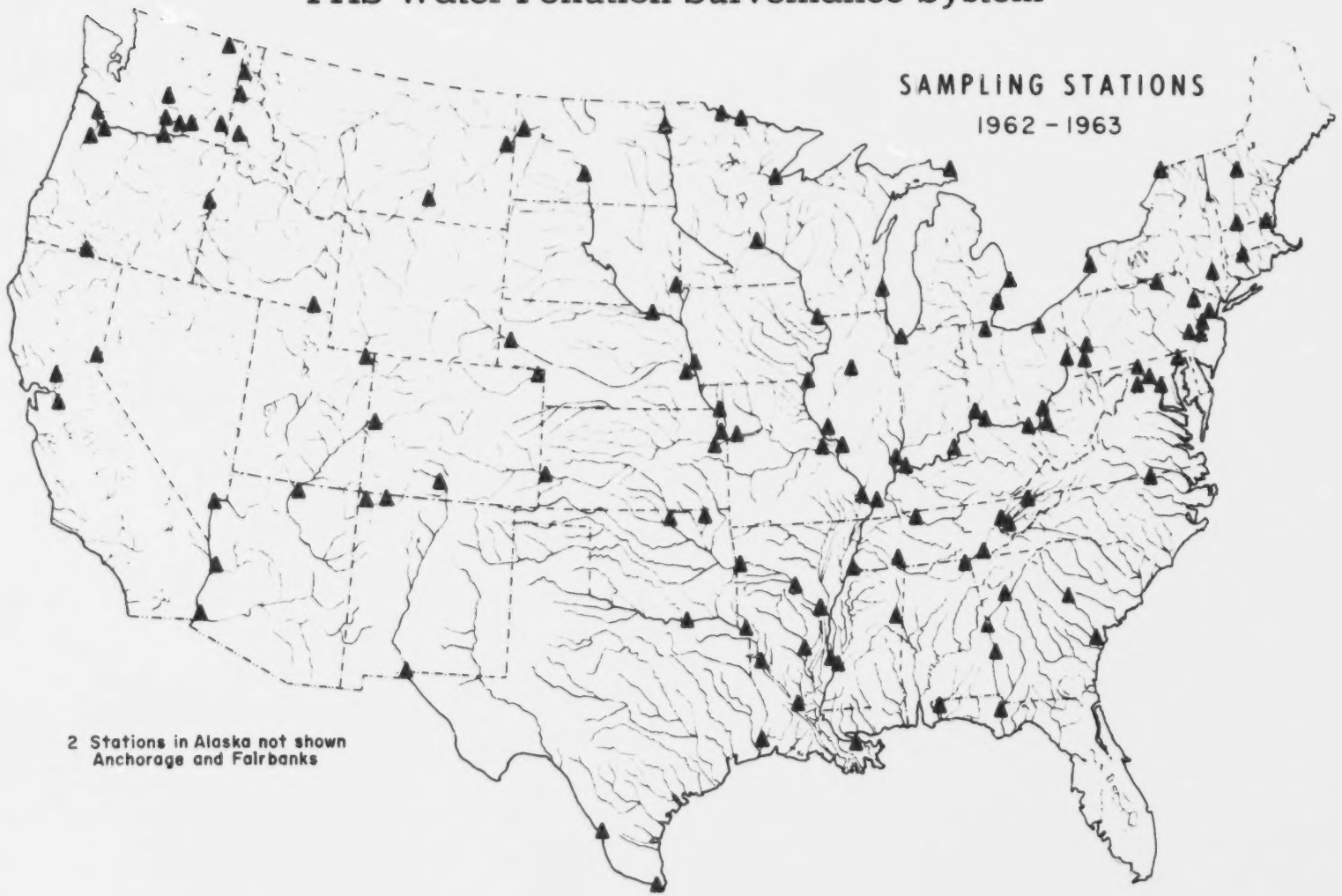
c. Waters on which activities of the Federal Government may have an impact.

Sampling station sites are fixed only after consultation with local, State, Federal and other agencies having related interests.

Active local participation is important in this operation. It assures maximum development of all information valuable both locally and nationally. Program costs are shared by the Federal Government and State and local agencies, those of the latter through contributions of laboratory and sampling manpower. Specifically, the State and local agencies perform certain of the conventional chemical analyses and collect samples for the newer, more complex examinations. The Public Health Service, in turn, performs the more complex determinations and makes the results available to the participants and to the public. In addition, the consultation, training facilities, and other resources of the Public Health Service are available to the cooperating agencies.

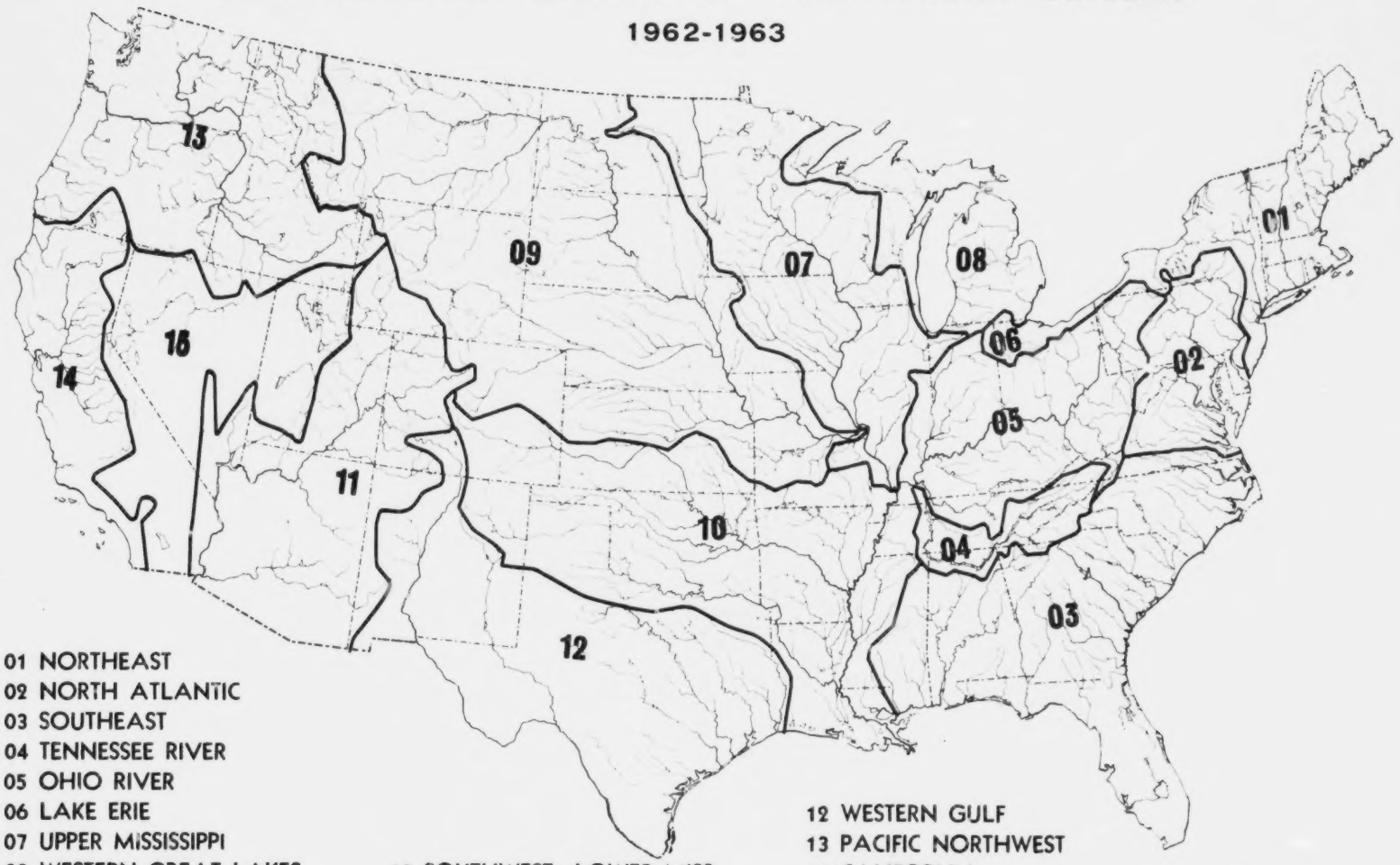
Locations of sampling stations in operation as of September 30, 1963, are shown on page 2. Descriptions of the stations, participating agencies, and other pertinent information are presented with the station data.

PHS Water Pollution Surveillance System



MAJOR RIVER BASINS OF THE UNITED STATES

1962-1963



01 NORTHEAST
02 NORTH ATLANTIC
03 SOUTHEAST
04 TENNESSEE RIVER
05 OHIO RIVER
06 LAKE ERIE
07 UPPER MISSISSIPPI
08 WESTERN GREAT LAKES
09 MISSOURI RIVER

10 SOUTHWEST—LOWER MISS.
11 COLORADO RIVER

12 WESTERN GULF
13 PACIFIC NORTHWEST
14 CALIFORNIA
15 GREAT BASIN

Only after careful screening of needs in water resource development was a pattern set for analyses of water samples.

All System samples are examined for:

a. Radioactivity.
   (1) Gross alpha.
   (2) Gross beta.
   (3) Strontium 90.
b. Plankton populations.
c. Coliform organisms.
d. Organic chemicals.
e. Biochemical, chemical, and physical measurements, including biochemical oxygen demand (BOD), dissolved oxygen (DO), chemical oxygen demand (COD), chlorine demand, ammonia nitrogen, hydrogen ion concentration (pH), color turbidity, temperature, alkalinity, hardness, chloride, sulfate, phosphates and total dissolved solids.
f. Sodium, potassium, fluoride and trace elements.

Samples for groups c and e were collected and analyzed weekly. Samples for organic chemicals were collected and analyzed monthly and plankton organism examinations were conducted semimonthly. Water samples for analysis of suspended and dissolved gross alpha and beta radioactivity were submitted weekly. Strontium 90 analyses were made on composites of weekly samples accumulated over 3-month periods. Sodium, potassium, fluoride, and trace metals were also determined on 3-month composites of weekly samples. New parameters which are developed and found significant will be included as the program continues.

Analytical Methods and Reliability of Data

The physical, chemical and biochemical data documented in this publication are the result of efforts of the cooperating agencies. In general, about half of these measurements were contributed by their laboratories. Specifically, all measurements reported for temperature, pH, DO, BOD, COD, chlorine demand and ammonia nitrogen were performed by the participants at the sample collection point. In addition, about 45 of the participating groups regularly perform all or most of the determinations for the remaining parameters included in the data. Whenever possible, analyses for stable constituents not completed by the participants are completed in the central Water Quality laboratories. While individual laboratories make minor modifications to meet local conditions, the methods used in most cases are those published in the 11th edition, "Standard Methods for the Examination of Water and Wastewater" (*22*). For uniformity, the chlorine demand test is reported on the basis of the starch-iodide titration procedure, and the chemical oxygen demand test is restricted to the use of 0.025 N reagents.

To assure continued reliability in the published data, frequent analysis of reference samples are made by each cooperating laboratory as an integral part of the overall program. Periodically a synthetic standard sample is provided to each participant for reference analysis. The reported results are reviewed. Any significant errors are called to the attention of the reporting laboratory and, after the cause of the errors has been determined, the previously submitted data are either corrected or discarded. From these findings, the analyses reported in this compilation are believed to be accurate to ± 10 percent of the reported values.

The analytical methods used by the Public Health Service laboratories are described in the discussion of water quality parameters which follows, and are covered by references listed in the Bibliography.

Water Pollution Parameters

In the assessment of water pollution, all of the legitimate purposes for which raw waters can be used, and which may be affected by pollution, must be considered. These may range from the minimum requirements for navigation to the ultimate in water quality demanded for certain industrial processing. Standards differ considerably, therefore, according to water use.

For domestic use, water must be free of disease organisms, clear, colorless, taste- and odor-free, and have a relatively low dissolved mineral content. Agricultural water is judged primarily on its mineral content, especially with respect to the ratio of sodium to other cations, and the presence of boron. Water for fish propogation and recreational purposes must be relatively free from domestic and industrial pollution and must be able to sustain an active flora of the smaller aquatic organisms on which fish and wildlife feed. Industrial water quality demands run the gamut from the complete absence of minerals to a requirement of low temperature, the critical factor in water used for cooling. The effects of radioactive materials on these uses have not yet been fully appraised.

The various laboratory examinations made as part of this program are discussed below.

Radioactivity

Radioactivity, long recognized as a water contaminant from natural sources, has continued to grow in importance and health significance with the development of nuclear energy for both military and peaceful uses. Consequently, levels must be measured continually as new sources are established.

Gross alpha and beta measurements are made on both suspended and dissolved solids in the raw surface water samples. The total radioactivity in the dissolved solids provides a rough measure of the levels which may be found in a treated water, where water treatment removes substantially all of the suspended matter.

Beta activity levels generally reflect the variable contamination resulting from fallout and discharges from nuclear energy installations, institutions utilizing radioactive materials, and other manmade sources. The trend of gross beta radioactivity in samples received from 47 of the Public Health Service Water Pollution Surveillance System stations operating since 1957 is presented in Figure 1. During the first three quarters of the 1962 water year, renewed weapons testing resulted in a rise in gross beta radioactivity in surface waters of the United States. During the sec-

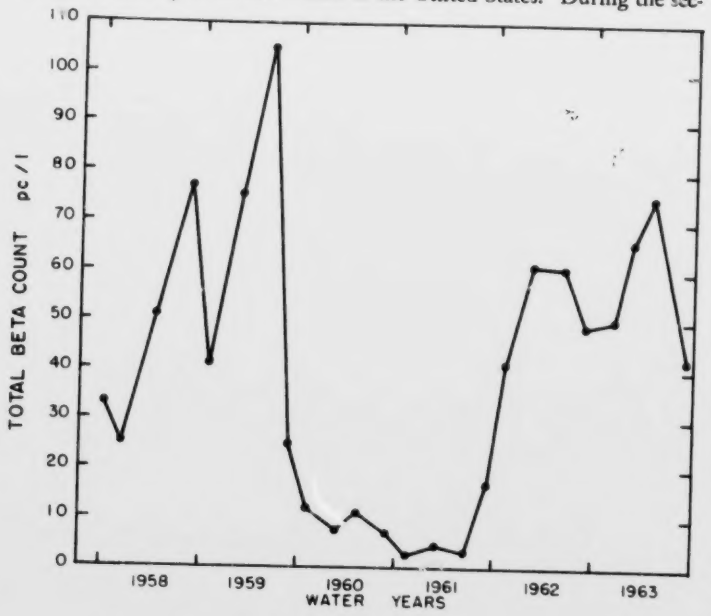


FIGURE 1. GROSS BETA RADIOACTIVITY IN THE SURFACE WATERS OF THE UNITED STATES.

ond and third quarter of water year 1963, the national average activity reached a maximum of 75 pico curies per liter and then decreased. Beta levels have remained well below the Public Health Service Drinking Water Standard of 1,000 pc/l or $\mu\mu$c/l (26).

Alpha levels reflect largely the activity added by uranium and thorium daughters. The waters of the United States can be characterized in a general way with respect to gross alpha radioactivity content. Gross alpha levels average less than 1 pc/l in east coast, Appalachian, Great Lakes, and Pacific Northwest States. On the Colorado Plateau, and along the eastern slope of the Rocky Mountains, natural radioactivity, principally from mineral deposits, results in average concentrations of about 20 pc/l.

Gross levels are most informative in ascertaining long-term trends or changes in water quality. By themselves, however, they are of limited value in assessing radiation exposure. Where gross results are consistently over the maximum permissible concentrations for mixed fission products, the identity of the specific radionuclides involved must be established.

Because of its significance in the environment, the concentration of strontium 90 in the total solids is also reported. In water year 1963, strontium 90 levels ranged from 0.4 to 11.3 pc/l. The national average reached a high of 3.8 pc/l during the fourth quarter (July, August, September 1963). Highest levels were in the north-central area of the coterminous United States where the average was approximately 6 pc/l for this quarter. All averages were less than the limit (10 pc/l) specified in the Public Health Service Drinking Water Standards (26). The levels of strontium 90 activity in waters of the United States since the first quarter of the 1959 calendar year are presented graphically in figure 2.

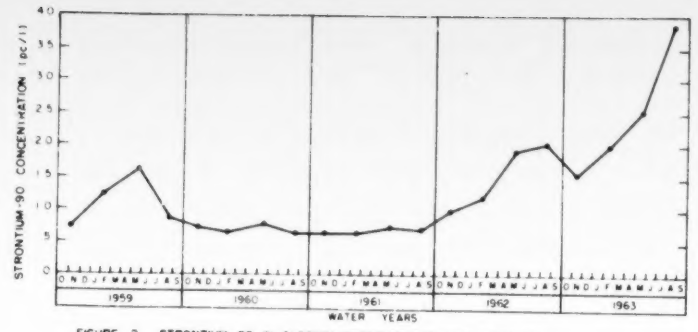

STRONTIUM-90 CONCENTRATION (pc/l)
40
35
30
25
20
15
10
5
0
O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S
1959
1960
1961
1962
1963
WATER YEARS

FIGURE 2 STRONTIUM-90 IN SURFACE WATER OF THE UNITED STATES

Plankton Populations

Geographical distribution of algae and other planktonic organisms are influenced by geologic and climatic factors, and result in distinctive plankton populations in different areas. Within each region, population changes are directly related to temperature, and the nature and concentration of organic and mineral substances which enter the aquatic environment. These substances may come from domestic sewage, industrial wastes, runoff from agricultural lands, irrigation discharges, or native rocks and soils. They may be basic nutrients, highly toxic, or metabolically inert. Planktonic organisms differ greatly in their sensitivity to the nutrient and toxic substances which are present. Some thrive only in water which is relatively free of nutrients while others multiply rapidly in water which has been greatly enriched. Large numbers of tolerant algae usually develop in waters containing abundant supplies of inorganic nitrogen and phosphorus resulting from the mineralization of domestic sewage. These nuisance populations may clog filters in municipal water plants, and produce objectional tastes and odors.

On the other hand, plankton populations may be eradicated by the introduction of toxic organic or mineral wastes. This is not desirable because some plankton organisms play essential roles in providing food and oxygen for higher forms of aquatic life, and in cleansing polluted waters.

Beginning at low nutrient levels, progressive enrichment of waters results in an increase in the variety and abundance of the plankton. However, as higher levels of enrichment are attained, the increase in total numbers of organisms is accompanied by a decrease in the number of kinds of organisms. This change is typical in populations which have been subjected to the wide spectrum of substances being introduced into

surface water in ever increasing amounts. Plankton counts, which provide information concerning the variety and abundance of organisms, are useful in detecting changes in the concentration of organic and mineral substances which enter water supplies.

METHODS OF ANALYSIS

Plankton samples are collected semimonthly at each station. A sample consists of 3 liters of raw water taken directly from the stream or from a treatment plant intake. Preservation is effected at the time of collection by the use of 30 ppm merthiolate.

Three types of analyses are performed:

1. Rotifers, crustacea, and other micro invertebrates are removed from a 1-liter aliquot of the sample by settling 24 hours. The sediment is placed in a special slide, 80 x 50 x 2 mm., and the organisms are enumerated under a compound microscope at 100× magnification. The counts are reported as organisms per liter.

2. A "total live algae" count is obtained from 1 milliliter of the sample by scanning two 50-mm. strips on a Sedgwick-Rafter slide using 200× magnification and a Whipple micrometer disc. An appropriate correction factor is used to convert the counts to units per milliliter. Each single cell or natural aggregate of cells (colony) occupying up to 300 square microns (μ^2) is counted as 1 unit. Large colonies are enumerated according to a modified areal-unit method in which aggregates occupying 300–1,000μ^2 are counted as 2 units, those occupying 1,000–2,500μ^2 as 3 units, those 2500–5000μ^2 as 4 units, and those over 5,000μ^2 as 5 units. About 95 percent of cell aggregates fall into size 1 or 2.

3. Identification and proportional census of diatom species are done from sediment obtained by settling 1 liter of the sample 48 hours. A small aliquot of the sediment is placed on a No. 1 coverglass and dried on a warming table. The sediment is ashed on the coverglass by heating on a hotplate, and permanent slides are made with hyrax mounting medium. Counts are made with 90× apochromatic oil immersion objectives and 10× oculars containing a Whipple micrometer disc. Random strip counts are made until the total number of units reaches 200 to 300. The same areal units are used as described for Sedgwick-Rafter counting.

Organic Chemicals

The Nation's water resources continue to receive increasing quantities of organic contaminants. Since 1940 the chemical industry, particularly in the manufacture of synthetic and petrochemicals, has experienced an enormous expansion that shows every sign of continuing. Each year millions of pounds of synthetic detergents, insecticides, herbicides, and similar domestic products find their way into our streams from household sewers, industrial waste discharges, and land runoff.

Effective and economical treatment methods for most of the complex organic materials remain to be developed. Even where treatment exists, residues may remain in sufficient quantity to cause water damage. These stable residues persist through sewage treatment, biological and chemical action of the stream, and water treatment processes, and finally reach the consumer in drinking water.

The presence of some of these materials, even at concentrations considerably less than 1 part per million, may impair water quality, most noticably in production of tastes and odors. Fish-flesh tainting, also quickly noticed by the consumer, is another damage. Effects on water treatment, many of which are ill-defined at present, and impairment of water quality for industrial uses are being reported with increasing frequency. Essentially nothing is known of the possible immediate or long-term effects of these materials on human health. Such information is urgently needed.

The usual sanitary analyses are not effective in measuring these newer organic contaminants. Yet it is essential to know something of their concentrations and character. A method known as the "Carbon Adsorption Technique," developed by the Public Health Service, permits the concentration of these organic compounds from a large volume of water. Elution of the adsorbed materials with organic solvents, followed by chemical separation and testing, provides useful information concerning organic pollution and for assaying river systems for these substances.

Following continuous flow of about 5,000 gallons of water through the carbon adsorption column over a 7- to 10-day period at 0.5 gpm. material on the carbon adsorption column is extracted with two solvents, chloroform and alcohol. The residues are weighed. The concentration of these materials in the water sampled is then computed. See Explanation of Analytical Data, page 21.

CHLOROFORM EXTRACTS

The organic residue recovered from the carbon adsorption column by chloroform is very complex. It is desirable to separate the crude extract into certain broad chemical classes, and this can be done on the basis of solubility differences. The various classes or groups and their general significance are discussed briefly below.

Ether Insolubles

This group is usually a brown, humuslike powder, apparently composed to a large extent of carboxylic acids, ketones, and alcohols of complicated structure. Origin of the group, which is an indicator of "old" pollution, is believed to be partially oxidized sewage and industrial wastes. For example, the Ohio River at Cincinnati has been exposed to much industrial and sewage pollution, and hence large amounts of ether insoluble materials are found. Streams with little or no pollution history have little or no ether insolubles. Chloroform extracts contain from 0 to 30 percent of ether insoluble material.

Water Solubles

These substances are largely acidic and undistillable at moderate temperatures, but their solubility in ether indicates that the molecules are smaller and probably simpler than the ether-solubles. On the other hand, their water solubility practically requires the presence of several functional groups, such as hydroxy-acid, keto-acid, and keto-alcohol. Such compounds probably originate from partial oxidation of hydrocarbons or they may be natural substances. They have very little odor. These materials usually make up 10 to 20 percent of the total extract.

Weak Acids

This group is characterized by being removed from ether solution with sodium hydroxide but not with sodium bicarbonate. Phenols are the best known weak acids, and if present in the water, appear in this group. Other weakly acidic compounds include certain enols, imides, sulfonamides, and some sulfur compounds. This group of materials also occurs in nature. The weak acids are odorous, and commonly constitute 5 to 20 percent of the chloroform extract.

Strong Acids

These acids are usually carboxylic acids such as acetic, benzoic, salicylic or butyric. Although classified as strong in reference to carbonic acid, they are actually weak when compared with a mineral acid, such as sulfuric. Many of the compounds are used industrially, but may also be produced by natural processes, such as fermentation. Some of the materials are highly odorous. This fraction makes up from 5 to 20 percent of the total. The significance of the strong acids can be interpreted only in the light of stream pollution conditions.

Bases

These compounds are organic amines. Such materials as aniline and pyridine are amines of commerce. Lower amines may occur as a result of decomposition. Although odorous, the low concentrations found are not likely to cause objectionable conditions. However, in the case of specific amine-containing wastes the compounds can be of considerable significance. Generally, only 1 or 2 percent of the total extract is made up of the bases.

Neutrals

This group frequently constitutes the major portion of the chloroform extract. Neither basic nor acidic, the materials are less reactive and tend to persist in streams longer than many other types. Hydrocarbons, aldehydes, ketones, esters, and ethers are examples of neutral materials. The group lends itself to further fractionation by means of chromatographic separation into aliphatic, aromatic, and oxygenated subgroups:

Aliphatics: This portion represents petroleum type hydrocarbons in a considerable state of purity, and is usually made up of mineral oil type of material. The percentage of aliphatics present yields important information about the possible source of pollution, since petroleum is the most likely source.

Aromatics: These are principally the coal tar hydrocarbons such as benzene, toluene, and a host of others, and their presence in any significant amount is a reliable indication of industrial pollution. Further, the materials can frequently be identified by infrared spectrophotometry. Some aromatic compounds which have been found in our rivers—and in our drinking water—include DDT, aldrin, endrin, dieldrin, phyenyl ether, orthonitrochlorobenzene, pyridine, phenol, and others. The materials are highly odorous, and may also be toxic. Their appearance in any quantity as pollutants should receive careful evaluation.

Oxygenated compounds (Oxys): These are the neutral compounds containing oxygen, such as aldehydes, ketones, and esters. They may have originated by direct discharge or may represent oxidation products from both natural and industrial materials. They help to indicate the "age" of the pollution, since pollution exposed to oxidation forces for a long time would be expected to contain large amounts of oxys. The oxy materials are odorous.

Losses

Manipulative losses inherent in this type of separation may amount to 10 to 15 percent. Losses greater than this may indicate that volatile components were lost from the sample. Such volatiles may have significance as pollutants.

ALCOHOL EXTRACTS

The alcohol extractables generally consist of materials more polar than the chloroform extractables. They often contain synthetic detergents, carboxylic acids and humic materials which may originate naturally or from oxidized products of domestic and industrial wastes. These classes of substances are not quantitatively recovered by the alcohol extraction. For example, this extraction recovers only 20 to 30 percent of the synthetic detergents present. On waters of mixed industrial and domestic pollution, the chloroform and alcohol extractables may be about equal. On some streams where the industrial pollution is rather low and much natural pollution or sewage is present, the alcohol extractables may exceed the chloroform extractables by a factor of 4 to 6.

The alcohol extract is usually only partially soluble in water and most ordinary solvents. Very little further chemical separation of this material is currently practical. However, tests have revealed that synthetic detergents may make up 1 to 12 percent of the alcohol extract.

OTHER TESTS

Infrared spectra are routinely run on the total chloroform and alcohol extracts as well as the neutral, aliphatic, aromatic and oxygenated groups which are usually the most significant. Spectra of other groups are obtained when there is an indication that they may be significant. These spectra reveal something of the chemical structure of the materials, indicate differences and in certain instances provide a definite identification. In the case of the alcohol extracts, the infrared spectra will indicate the presence of synthetic detergents if the materials constitute a significant portion.

Thin layer chromatography has been applied successfully to the resolution of the aromatic and basic fractions of CCE. Gas chromatographic equipment with flame ionization, electron capture and microcoulometric detectors have also been used freely in the identification of specific substances.

COMPOSITE ANALYSIS

Samples from certain locations have been selected for analysis on a quarterly composite basis. Stations that have collected at least 12 samples in a nearly consecutive manner and averaged 100 ppb. or less of chloroform extractables are selected for such analysis when certain other conditions are met. However, samples falling in this category are analyzed individually when the recovery of the chloroform extract is exceptionally high and/or it is unusual in its infrared spectrum or some other physical characteristic.

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SPECIFIC IDENTIFICATIONS

Information about specific organic substances which were identified in carbon adsorption samples is given on the second page of the group associated with each station. The increased number of pesticide and other specific compounds identified, as compared to previous years, is partly associated with greater sensitivity in analytical methodology and may be partly a reflection of the increasing usage of these substances in the total environment.

Chemical, Physical, and Bacteriological Examinations

The various biochemical, chemical, physical, and bacteriological examinations generally performed by the participating laboratories are discussed below.

AMMONIA NITROGEN AND CHLORINE DEMAND

The cost of water treatment for domestic use is affected by the consumption of chlorine, with ammonia nitrogen being responsible for a large portion of the chlorine demand. The greater this demand, the more expensive is the treatment. The ammonia may originate from unstabilized domestic pollution, from industrial waste discharges, from run-off containing fertilizers used in farming operations or from all three. The presence of measurable quantities of nitrogen compounds, not necessarily ammonia, is also an indication of the fertility of the stream toward both macro- and micro-biological forms.

COLOR

Color in domestic water supplies is undesirable. Its removal in the water treatment process, whether it be from natural or industrial sources, may require large doses of chemicals and be expensive.

DISSOLVED OXYGEN, BIOCHEMICAL AND CHEMICAL OXYGEN DEMANDS

Biochemical processes, in which aquatic organisms attack and stabilize the organic matter present, require dissolved oxygen. If unstable oxidizable organic matter is present in excess, the organisms will multiply rapidly, consuming the oxygen present in the water, and bring about a foul, septic stream condition. The dissolved oxygen level thus serves to indicate the biochemical activity of the stream. High activity, resulting in low dissolved oxygen levels, will drive out game fish in favor of scavengers. Very low or zero oxygen levels will kill all fish and aquatic organisms dependent on dissolved oxygen for life. Temperature and reaeration rates also affect dissolved oxygen levels.

The 5-day biochemical oxygen demand (BOD) indicates the degree of unstabilized organic pollution from either domestic or industrial sources, to which the stream is being subjected. A significant demand will affect the fish and macroorganism population, and waters carrying a high BOD seldom contain game fish. On the other hand, game fish will thrive in streams in which the oxygen demand has been stabilized, as this condition is usually favorable for the growth of organisms on which fish feed.

The chemical oxygen demand analysis serves to support the findings of the biochemical oxygen demand test. It too may indicate to what extent the waste load of the stream has been stabilized, or it may indicate the presence of organic and inorganic pollution which is not readily oxidized by biological processes. Because the chemical oxygen demand can be determined quickly in comparison to the biochemical oxygen demand, the establishment of a correlation between the two parameters serves to reduce the number of the latter determinations required. The chemical demand results are nearly always higher than the biochemical demand.

TEMPERATURE

Temperature is particularly important to conservation and industry. A few degrees elevation in temperature due to cooling water discharges may seriously limit the capacity of a stream to support fish life. Also, high water temperatures increase the cost of cooling water for

industrial operations. Cooling towers and other equipment for handling cooling water must be engineered to the temperature levels normally encountered.

MINERAL CONSTITUENTS

These determinations include alkalinity, hydrogen-ion concentrations (pH), hardness, chlorides, sulfates, and total dissolved solids. The pH indicates whether water is acidic or alkaline, corrosive or passive. Alkalinity is a measure of the neutralization reserve present, or the extent to which the water can resist a change from an alkaline to an acid condition upon addition of acidic chemicals. This information is important to the water treatment plant operator and to many other water users.

Hardness is not only a measure of the soap consuming property, but is also of importance in the treatment of boiler waters, where removal of hardness is one of the most important functions. Chloride, sulfate, and total dissolved solids add further information on the gross dissolved mineral content carried by the stream. These are of great importance when considering the taste or palatability of water. They are also important when the water is being demineralized for specific industrial processes, since the cost of demineralization is a direct function of the dissolved solids content of the water. In addition, waters of high saline content are less desirable and may at times even be unfit for municipal, irrigation, and other uses.

TURBIDITY

Turbidity of water is due to the suspension of clay, silt, finely divided organic matter, microscopic organisms, and other similar materials. Its presence is of particular importance in water treatment processes and in the propagation of fish and other aquatic life.

COLIFORM ORGANISMS

Information about fecal pollution is essential to water quality measurements. Data on coliform bacteria, used as indicators of pollution, help to point up the trends in the effectiveness of treatment of domestic waste discharges.

The delayed-incubation membrane filter technique is used for the coliform examination, instead of the fermentation tube (MPN) method. The latter necessitates transport of water samples to the Water Quality Section laboratory for examination, with a time lapse between collection and examination that can significantly change their microbial content. Also, some of the many other bacteria present in raw water might overgrow or otherwise inhibit the demonstration of the coliform organisms. In the delayed-incubation membrane filter procedure, the bacteria are filtered out from the fluid samples immediately after collection and the filters sent to the Water Quality Section laboratory on a preservative medium. In the laboratory the membrane filters carrying the bacteria are transferred to a medium selective for coliform organisms, then incubated and counted. The resulting counts approach very closely the actual numbers of coliform bacteria present in the water samples at the time of collection.

Unusual populations of coliform bacteria may mean increased pollution and ensuing loss of water quality. The Public Health Service Water Pollution Surveillance System studies and reports the trends in sewage pollution on streams as indicated by the trends of coliform counts.

Trace Elements and Other Determinations

This year's trace element data differ somewhat from data reported in previous compilations in that the manner of obtaining the data has been modified and the program of elements measured altered. The trace metals measurements are now obtained from a 3.4 meter direct reading spectrograph. Tin, antimony, and bismuth have been discontinued; arsenic, boron, phosphorus, aluminum, and strontium have been added. Increased sensitivity for several elements has been attained, especially zinc, manganese, and beryllium, resulting in fewer indeterminate values.

Twice during the year, 3-month composites of the weekly samples were prepared and subjected to analysis. Examinations covered those elements included in the Public Health Service Drinking Water Standards (*26*), and other metals considered to have possible physiological or

toxicological significance. The ultimate goal of this phase of the program is to provide background data on all elements which may be found in water and which may be of significance in water quality management.

In carrying out the spectrographic examination, the sample is first passed through a membrane filter, .045 micron pore size, to remove all suspended matter. An aliquot of sample is then acidified with redistilled nitric acid and evaporated to a concentration containing 100 mg. of dissolved solids in 5.0 ml. A portion of the prepared sample is placed in a porcelain boat and sparked using a rotating disc, with concentrations of the 19 programed elements measured on the direct reader (*12*).

Waters of low dissolved solids content can be concentrated to a greater degree than those having a high dissolved solids content, thus accounting for the variable sensitivity shown in the tabulations. Values followed by an asterisk (*) show the limits of sensitivity at which the test was performed and indicate that the ion being measured was not detected at that level.

It is known that trace concentrations of some ions are subject to precipitation and adsorption on container surfaces during storage. This applies particularly to iron and manganese which are subject to oxidation. Hence, all the values reported by the spectrographic method represent the quantity of metal in solution at the time of analysis to within about 10 percent.

The measurement of sodium and potassium is performed using a flame procedure. Fluoride is determined with the SPADNS reagent using the method described by Bellack and Schouboe (*3*). Boron, previously measured by the curcumin procedure, is now reported from the spectrograph. Measurement of selenium has been eliminated due to the general absence of this element from the samples examined.

The concentrations of surface active agents, reported as alkyl benzene sulfonate (ABS), in the Nation's surface waters is reported for the first time on a number of selected stations. As the capability of determining this pollutant increases, efforts will be made to include all sampling points in the Surveillance System. The data presented here were obtained using a modification of the Standard Methods methylene blue procedure on an automatic analyzer.

The Benthos

Animals and plants that live in or on the bottom substrata of lakes and streams are known as the benthos. This biological community includes such common animals as immature insects, worms, clams, snails, and crustacea. The benthic populations found on a stream bottom are largely determined by the type of substrate. Bottoms consisting of soft silty sediments are normally inhabited by animals that are able to burrow into the sediments and feed on organic detritus in the sediments. These include worms, clams, and certain insect larvae. The number of species is usually small in these habitats. Shallow streams with shoals, rapids, and riffles have more available niches for animals to occupy and the normal benthic fauna usually includes a large variety of organisms.

The benthic populations provide a basic indicator of general water quality. Whereas the plankton organisms move downstream with the current, and fish are able to migrate considerable distances, the benthos is a population relatively fixed on the bottom and the animals are subject to the water flowing over them. The benthic populations will therefore be influenced by the quality of the water.

The animals that make up the benthos have various life cycles. Insects may exist as aquatic larvae living in the bottom for as long as 2 years. They then emerge as adults and mate. The female deposits fertilized eggs into the stream. Some of the class produce young which attach themselves to fish. Some of the worms reproduce asexually. An analysis of the age structure of certain forms in the benthos may provide information on past conditions of the water.

Under conditions of good water quality the benthos should include a variety of species with no one species being present in excessive numbers. If the water should become degraded, certain species in the population, intolerant of the changed environment, will die out; and as the water quality deteriorates, increased numbers of species in the benthos will be eliminated. The one or more species that survive may be able to develop very large populations. Toxic materials in the water or deposited on the bottom may effectively eliminate all bottom life.

At each station where bottom samples are taken an attempt is made to find areas of suitable substrate. From these areas, where pos-

sible, a series of at least six quantitative samples is taken by means of suitable dredges or samplers. In riffles the Surber squarefoot sampler is used. In deep rivers the Ekman or Peterson dredge is used (see Standard Methods, for the Examination of Water and Wastewater, 11th edition, pp. 572-582) (*22*). A general qualitative collection of invertebrate life is usually made at all stations.

The bottom materials are screened in the field using a screen with 28 meshes to the inch. The concentrated sample is preserved in alcohol and returned to the laboratory.

In the laboratory the sample is transferred to pans and the macroscopic organisms are separated from the sediment and detritus. The animals are then identified as near to species as possible, enumerated, and weighed. Specimens are preserved and retained for future reference.

During this year benthos data were gathered for stations in the Ohio and Tennessee River basins only and are presented with the descriptive material for the appropriate stations. A supplemental analysis of these data will be published separately.

Fish Populations

Fish are a biological end product of the aquatic environment. They are an important source of food, and sport fishing is one of our leading forms of recreation. The maintenance of fish life has been recognized by the Congress, and by States which have protective pollution control legislation, as an important and legitimate use of our Nation's waterways. In other words, in measuring fish populations at Surveillance System stations, we are not measuring a parameter that affects a water use as in the case of other measurements presented in this compilation, but rather a unique parameter that is in itself considered a beneficial water use.

The water quality requirements and tolerance of aquatic life to different types of contaminants vary tremendously. It is this variability in response which makes living aquatic organisms usable indicators of environmental disturbance. Fish require water relatively high in dissolved oxygen, and are intolerant of many chemical and physical contaminants resulting from agricultural, industrial and mining practices. However, the tolerance of different species varies, and man-induced changes of the environment often affect one species more than another, producing imbalanced populations which quite often favor the species less desirable economically.

Moderate amounts of putrescible wastes may enrich the habitat, resulting in great increases in standing crops of fish present. However, under such conditions, the more tolerant and adaptable species may comprise a disproportionate share of the total population, and very sensitive species may be eliminated altogether. The effect of toxic wastes may vary from complete elimination of populations to a reduction in reproductive capacity, growth and resistance to disease and parasitism.

Fish kills are a spectacular and obvious indication that an abrupt change has taken place in the environment. However, because of high mobility resulting in rapid recruitment, the fish population in a river or stream may return to normal levels within a very short time after a kill.

Chronic pollution, to which the fish population must adjust over a period of time, will be reflected in the kinds and relative abundance of the fish species present. In addition to the species composition, the condition of the fish, their growth, reproductive success and certainly their palatability are factors of considerable importance in evaluating the suitability of a body of water for supporting usable stocks of fish.

During the current water year, data on fish populations were gathered for some stations in the Ohio and Tennessee River basins only, and are presented in tables in volume 5 for the appropriate stations.

Fish samples at these stations were collected primarily with rotenone and with an electrofishing device. Five percent emulsified rotenone was applied at suitable sites, where an area of 1 to 3 acres could be blocked off with nets during the rotenoning operation. Such sites were usually in the form of small coves along the shoreline, the mouths of small tributaries, or behind the partial enclosure created by navigational lock walls. An electrical shocking device was used along the shoreline both during the day and at night. In a few cases, samples were also collected with trammel nets and with short, 25-foot haul seines. Sampling with nets and seines was limited because of the paucity of habitat in large rivers which is suitable for using these types of gear.

With each method used sufficient sampling was done to collect as many species present as possible, and to obtain a measure of the relative abundance and size distribution of the various species. Every type of fishing gear is somewhat selective, and the data obtained may not be representative of the actual population composition present in the river at the time of sampling. However, the data obtained by a given method are quantitatively comparable and may be used to evaluate changes in the population composition resulting from natural and man-induced changes in the habitat. Comparisons should be based on samples collected with the same gear, during the same season of the year, and under similar conditions of stream flow and water temperature. These data will be particularly useful in determining the impact of changes in water quality on the fish populations of the Nation's rivers over long periods of time.

For convenience of comparison, the fish in the tables are grouped into six major categories based on food habits and methods of feeding:

I. Large, sight feeding carnivores that feed on other fish. This group includes most game species.

II. Species that feed primarily on insects. This group provides important forage for species in group I.

III. Species that feed primarily on plankton and algae. These also provide important forage for group I species.

IV. Species that feed primarily on mollusks.

V. Omnivores that feed indiscriminately on plant and animal matter from the bottom.

VI. Scavengers that take any available food. Some of the species in this group may sometimes act as predators. The group also includes many important food fish, and species that are tolerant of degraded conditions.

Because foods and feeding habits vary with size, age, and availability of food, there may be considerable overlap between groups. The species listed were grouped according to available literature regarding the main foods of adult specimens of each species.

In the field the total length of the fish was routinely measured to the nearest inch class on a one-half inch interval. Thus a fish in the 5-inch class would measure from 4.5 inches to slightly under 5.5 inches. If the end of the tail touched the dividing line between two length classes, the fish was included in the higher classification. The percent total number and weight are carried to the nearest one-tenth of 1 percent in the tables. The one-tenth of 1 percent was arbitrarily selected for purposes of tabulation, and does not imply such a high level of sampling accuracy.

The fish are listed by common names in the tables according to American Fisheries Society Special Publication No. 2 (1960), A List of the Common and Scientific Names of Fishes From the United States and Canada, Second edition (*1*).

Stream Flow

Stream flow data have a most important role in the utilization of water quality parameters such as are included in this report. For this reason, average daily flow records are reported for most of the sampling stations in the System.

All flow data included in this compilation are *provisional* data furnished by the agencies credited, and are subject to revision by such agencies prior to any final publication. With the exceptions mentioned, the flows are given as furnished to the Public Health Service.

The data were generally furnished in units of cubic feet per second. In general only the first three digits were considered significant. Because of machine limitations the data are reported here in thousand cubic feet per second. Even though three zeros may appear after the decimal, no artificial accuracy of measurement is implied. Only the first three digits should be considered significant. There are two exceptions:

(1) When the flow was over 1 million cubic feet per second, the first four digits are reported, and (2) at times when the Rio Grande flows were extremely low, the data were reported to tenths of a cubic foot per second. These figures are published showing 4 decimal places.

Flow data for sampling stations on the rivers of the Great Lakes system are reported as the monthly mean flow, as computed by the U.S. Lake Survey. In certain other rivers, flow data were computed by the Public Health Service from information supplied by the gaging agency. The methods of computations are shown as footnotes to the data for the applicable stations.

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Explanation of Analytical Data

RADIOACTIVITY DETERMINATIONS

In evaluating radioactivity data it should be noted that the reported errors represent counting errors only and the reported values are subject to other errors commonly associated with gross radioactivity analysis. (See Reference 22.)

A dash (—) in the count column signifies that no determination was made. An asterisk (*) following date of sample indicates that determinations are for composites of two or more samples taken on and before the date shown.

Strontium 90 determinations are reported in micro-microcuries per liter as measured from total solids in the sample composited for the quarter. A dash (—) indicates that no determination was made in that period.

PLANKTON POPULATION

Plankton data are reported on two pages. The first page lists the population size of various groups of algae. A coded number shows the ten most abundant genera of algae and their count level. Code numbers used are identified on page 18. Blank spaces on the data sheets signify that counts of other genera were below a level of 150 per ml. The second page of plankton data lists the four dominant diatom species and their occurrence as a percent of the total diatom population. The percent of occurrence of all other diatom species is shown in the next column. Identification codes of species are given on page 19.

The detectable numbers per ml. of fungi, sheathed bacteria and protozoa are shown in the next two columns. The rotifer and crustacea totals per liter are listed together with the genera where these occurred at a count level of five or more per liter for rotifers and three or more per liter for crustacea. Nematode and miscellaneous animal form counts per liter appear in the last two columns.

A dash (—) indicates that no analysis was made. A zero count of each group is indicated by "0". Blank spaces under abundance and dominance columns indicate that the populations were too few to be included or were absent. Coding for abundant genera of rotifer and crustacea population levels are presented on page 20.

PLANKTON POPULATION

Identification Codes of Algae Genera and Count Levels of Most Abundant Genera

KEY TO COUNT LEVEL (per ml.)

1 150 to 300
2 301 to 600
3 601 to 1,200
4 1,201 to 2,400
5 2,401 to 4,800
6 4,801 to 9,600
7 9,601 to 19,200
8 19,201 to 38,400
9 38,401 and over

Code to ALGAE GENERA (Producers)

Blue-green Algae

01 Agmenellum (Merismopedia)
02 Anacystis (Microcystis)
03 Anacystis
04 Coccochloris
05 Gomphosphaeria
06, 07, 08 Reserve
09 Other genus
10 Other genus

Filamentous blue-greens

11 Anabaena
12 Aphanizomenon
13 Arthrospira
14 Lyngbya
15 Oscillatoria
16 Phormidium
17 Raphidiopsis
18 Spirulina
19, 20, 21 Reserve
22 Other genus
23 Other genus

Coccoid green algae

24 Actinastrum
25 Ankistrodesmus
26 Chlorella-type
27 Chlorococcum
28 Closterium
29 Coelastrum
30 Crucigenia
31 Dictyosphaerium
32 Golenkinia
33 Lagerheimia
34 Micractinium
35 Oocystis
36 Palmellococcus
37 Pediastrum
38 Scenedesmus
39 Staurastrum
40 Tetradesmus
41 Tetrastrum
42, 43 Reserve
44 Other genus
45 Other genus

Filamentous green algae

46 Cladophora
47 Stichococcus
48 Stigeoclonium
49 Reserve
50 Other genus

Green flagellates

51 Chlamydomonas including Carteria
52 Euglena
53 Lepocinclis
54 Pandorina
55 Phacotus
56 Phacus
57 Trachelomonas
58 Reserve
59 Other genus

Other pigmented flagellates

60 Chromulina
61 Dinobryon
62 Gymnodinium
63 Peridinium
64 Reserve
65 Other genus

Diatoms (with chromatophores)

Centric

66 Biddulphia
67 Coscinodiscus
68 Cyclotella
69 Melosira
70 Rhizosolenia
71 Stephanodiscus
72 Other genus

Pennate

73 Achnanthes
74 Amphiprora
75 Amphora
76 Anomoeoneis
77 Asterionella
78 Caloneis
79 Cocconeis
80 Cymatopleura
81 Cymbella
82 Diatoma
83 Diploneis
84 Fragilaria
85 Gomphonema
86 Gyrosigma
87 Navicula
88 Nitzschia
89 Pleurosigma
90 Rhoicosphenia
91 Surirella
92 Synedra
93 Tabellaria
94, 95, 96 Reserve
97 Other genus
98 Other genus
99 Other genus

PLANKTON POPULATION

Identification Code for Diatom Species

No.	Species
01	Achnanthes lanceolata
02	Achnanthes minutissima
03	Achnanthes sp.
04	Amphiprora paludosa
05	Amphiprora sp.
06	Amphora ovalis
07	Amphora sp.
08	Anomoeoneis exilis
09	Asterionella formosa
10	Bacillaria paradoxa
11	Biddulphia laevis
12	Caloneis amphisbaena
13	Caloneis sp.
14	Ceratoneis arcus
15	Cocconeis pediculus
16	Cocconeis placentula
17	Cocconeis sp.
18	Coscinodiscus rothii
19	Coscinodiscus (brackish)
20	Coscinodiscus sp.
21	Cymatopleura solea
22	Cymatosira belgica
23	Cyclotella atomus
24	Cyclotella comta
25	Cyclotella kutzingiana
26	Cyclotella meneghiniana
27	Cyclotella pseudostelligera
28	Cyclotella stelligera
29	Cyclotella striata
30	Cyclotella sp.
31	Cymbella ventricosa
32	Cymbella tumida
33	Cymbella sp.
34	Denticula sp.
35	Diatoma elongatum
36	Diatoma vulgare
37	Diatoma sp.
38	Diploneis smithii
39	Diploneis sp.
40	Epithemia turgida
41	Epithemia sorex
42	Epithemia sp.
43	Eunotia sp. (first)
44	Eunotia sp. (second)
45	Fragilaria capucina
46	Fragilaria construens
47	Fragilaria crotonensis
48	Fragilaria pinnata
49	Fragilaria sp.
50	Frustulia sp.
51	Gomphonema olivaceum
52	Gomphonema sp.
53	Gyrosigma kutzingii
54	Gyrosigma sp.
55	Hantzchia amphioxys
56	Melosira ambigua
57	Melosira distans var. alpigena
58	Melosira granulata
59	Melosira binderana
60	Melosira islandica
61	Melosira italica
62	Melosira varians
63	Meridion circulare
64	Navicula cryptocephala
65	Navicula sp. (first)
66	Navicula sp. (second)
67	Nitzschia acicularis
68	Nitzschia tryblionella
69	Nitzschia denticula
70	Nitzschia (Lancelolatae group)
71	Nitzschia sp. (first)
72	Nitzschia sp. (second)
73	Opephora martyi
74	Pinnularia sp.
75	Pleurosigma delicatulum
76	Rhoicosphenia curvata
77	Rhizosolenia eriensis
78	Rhopalodia gibba
79	Rhopalodia sp.
80	Stephanodiscus astraea var. minutula
81	Stephanodiscus dubius
82	Stephanodiscus hantzschii
83	Stephanodiscus niagarae
84	Stephanodiscus sp.
85	Surirella brightwelli
86	Surirella ovata
87	Surirella striatula
88	Surirella sp.
89	Synedra acus
90	Synedra pulchella
91	Synedra nana
92	Synedra ulna
93	Synedra vaucheriae
94	Synedra sp.
95	Tabellaria fenestrata
96	Tabellaria flocculosa
97	Any entity not found above (first)
98	Any entity not found above (second)
99	Reserved for future entity
xx	Insignificant or population inadequate

PLANKTON POPULATION

Identification Codes of Microinvertebrate Genera and Count Levels of Most Abundant Genera

Genera of ROTIFERS
Key to counts per liter

1 5 to 10
2 11 to 20
3 21 to 40
4 41 to 80
5 81 to 160
6 161 to 320
7 321 to 640
8 641 to 1,680
9 1,681 and over

Genera of CRUSTACEA
Key to counts per liter

1 3 to 5
2 6 to 10
3 11 to 20
4 21 to 40
5 41 and over

Code to
MICROINVERTEBRATES

Rotifers

01 Asplanchna
02 Brachionus (also Platyias)
03 Collotheca
04 Cephalodella
05 Chromogaster
06 Euchlanis
07 Filinia
08 Gastropus
09 Hexarthra (also Pedalia)
10 Kellicottia
11 Keratella
12 Lepadella
13 Monostyla (also Lecane)
14 Notholca
15 Philodina and similar contracted bdelloids
16 Ploesoma
17 Polyarthra
18 Pompholyx
19 Proales
20 Rotaria
21 Synchaeta
22 Trichocerca
23 to 45 Reserve
46 Other genus
47 Other genus
48 Other genus
49 Other genus

Cladocerans

50 Nauplii
51 Bosmina and related genera
52 Daphnia and related genera
53 Moina
54 Polyphemus
55 to 72 Reserve
73 Other genus
74 Other genus
75 Other genus

Copepods

76 Cyclops,Euclops, and Paracyclops
77 Diaptomus
78 to 97 Reserve
98 Other genus
99 Other genus

Blank—Insignificant or population inadequate

ORGANIC CHEMICALS

Although units of concentration may be assigned to the values reported herein (µg/l or parts per billion), it is essential that the user of these data consider additional associated information. Introspective examination of the data reported herein has indicated that comparison of concentration values obtained from samples of similar gallonage are more valid than samples of widely differing gallonage. In addition, recent experimental researches have shown that lower flow rates and lower sample volumes than those employed (5,000 gallons at 0.5 gpm) are substantially more efficient and should produce relatively higher concentration values with this method. The first in a series of changes designed to increase sampling efficiency is already underway at Water Pollution Surveillance System stations.

Concentration values reported for specific substances are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE. In light of an unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.

Zeros when reported have been entered. A dash indicates that the respective results were not reported. An asterisk in the column showing end of sample date indicates that the determinations are for composited samples taken on and before the date shown. The extent of compositing can be determined by examining the gallons filtered, which is the sum of the applicable individual samples immediately above it.

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

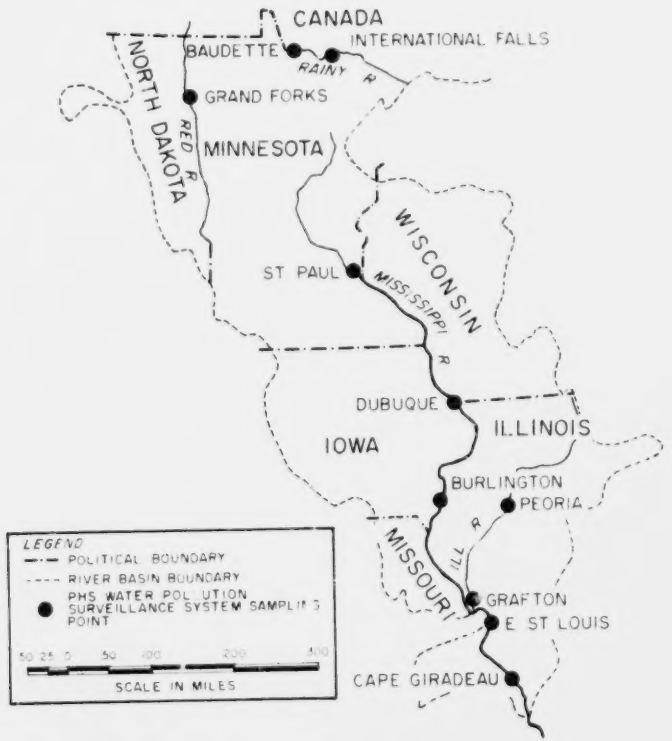
The data entered in each column are as reported. Concentrations of alkalinity and hardness are reported in milligrams per liter as $CaCO_3$. A dash signifies that the particular test was not performed. Zeroes when meaningful have been entered. An asterisk preceding a number should be read as "less than" the number following it.

TRACE ELEMENTS AND OTHER DETERMINATIONS

For a discussion of the sensitivity limits of the determinations performed with spectrographic methods, see page 11.

BASIN 7

UPPER MISSISSIPPI



Portions of eight States are within the Upper Mississippi Basin. For convenience of reference this basin is considered to include the Red River of the North and the Rainy River basins which flow into Canada in addition to the Mississippi River and its tributaries from its origin to the confluence of the Ohio River.

The Mississippi River heads in Lake Itasca in northeast Minnesota and flows generally southeastward. The river is navigable from the Minneapolis-St. Paul area. The principal tributary to the Mississippi in this basin is the Missouri River at St. Louis; Missouri River Basin data are presented in volume 7 of this series.

Average annual precipitation ranges from 25 inches in the headwaters to 45 inches at the southern terminal.

Red River of the North: This stream is formed at Wahpeton, N. Dak., by the junction of the Bois des Sioux and Otter Tail Rivers, and flows north into Canada where it discharges into Lake Winnipeg. The United States portion of the drainage basin covers about 34,300 square miles. Precipitation in this area averages 20 inches per year with about half occurring during the growing season. Average temperatures in January and July are 5° and 69° F., respectively. The Red River is used for municipal water supply and waste disposal.

Rainy River: This river starts with outflow from Rainy Lake and forms a portion of the International Boundary between the United States and Canada and drains about 11,100 square miles in Minnesota. The average annual precipitation ranges from 21 to 29 inches. Much of the surrounding terrain is swampy and heavily forested.

Mining, lumbering, pulp and paper manufacturing, recreation and agriculture are the principal industries in this area.

Illinois River: The Illinois River basin covers 26,800 square miles, mostly in Illinois. The entire river is navigable so that water transportation is possible between the Great Lakes and the Gulf of Mexico. The Illinois River joins the Mississippi River near Grafton, Ill. The terrain ranges from rolling to flat and the soil type is glacial drift. Precipitation averages about 32 inches per year. A major portion of flow in the upper reach of the Illinois River is secondary sewage treatment plant effluent from Chicago.

Agriculture is an important activity in the lower half of this river basin.

Except for the Rainy River, phytoplankton counts of 20,000–70,000/milliliter are not uncommon throughout the basin. The Illinois River has an especially rich and diverse algal flora, reflecting high levels of nutrients.

Centric diatoms are generally the most abundant algae but summer pulses of coccoid greens (largely *Scenedesmus, Ankistrodesmus, Actinastrum* and *Micratinium*) make substantial contributions to the total phytoplankton count. The more abundant centric diatoms are *Stephanodiscus hantzschii, S. astrea* var. *minutula, Melosira ambigua,* and *Cyclotella meneghiniana.* The diatom species diversity is especially low in this basin. The first four most abundant diatom species generally comprise more than 80 percent of the diatom population.

The high algal populations support an abundant rotifer fauna approaching 5,000/liter at times in the Illinois River. The most numerous forms are *Keratella, Brachionus, Trichocerca,* and *Synchaeta.*

Analyses of quarterly composites of weekly samples for the last quarter of the water year (July through September) revealed a sharp increase of strontium-90 levels in surface waters in the Upper Mississippi Basin. Average values for the basin rose from 2.2 picocuries/liter (pc/l) during the first quarter to 3.4 pc/l and 6.4 pc/l during the third and fourth quarters, respectively. These concentrations were about 65 percent above the national average. The maximum value for the last quarter was 11.3 pc/l from the Red River at Grand Forks, N. Dak. This maximum exceeded the limit of 10 pc/l for strontium-90 in the Public Health Service Drinking Water Standards as set forth by the Federal Radiation Council. This limiting value was established with the provision that the radiation dose rates be averaged over a period of 1 year. Analyses of samples collected during the subsequent quarter, which will be reported in the next annual compilation, showed substantially lower levels of strontium-90 with the relatively higher concentrations still confined to the north-central area of the conterminous United States.

The chlorinated hydrocarbon insecticide, endrin, was identified in the August 1963 sample obtained by the carbon adsorption method at Cape Girardeau, Mo. Nonquantifiable traces of endrin were detected at upstream stations during the August–September period. During this period dieldrin was also identified at all Mississippi River stations from Cape Girardeau, Mo., to St. Paul, Minn. These positive identifications were made possible by the development of improved analytical techniques involving thin-layer chromatography, electron-capture and microcoulometric titration gas chromatography, and infrared spectroscopy. The public health significance of the calculated pesticide concentrations is unknown. However, the necessity for an increased surveillance effort is apparent.

ILLINOIS RIVER NEAR GRAFTON, ILLINOIS

The Public Health Service Water Pollution Surveillance System station at this site is 7 miles above the confluence of the Illinois River with the Mississippi River. Samples are collected at the intake of Pere Marquette State Park pump house.

Fluoride concentrations have increased at this sampling point over a two-year period as shown in the following table:

Period	Fluoride mg/l
12/12/61 - 3/20/62	0.37
3/26/62 - 8/20/62	0.30
10/01/62 - 12/31/62	1.12
4/01/63 - 6/30/63	0.85

ABS concentrations have been reduced from those found upstream at Peoria, in accord with the dilution in higher flows. They are still relatively large and reflect municipal discharges from the metropolitan Chicago area.

Station Location: Illinois River near Grafton, Illinois

Major Basin: Upper Mississippi River

Minor Basin: Illinois River

Station at: 38°58' Latitude 90°33' Longitude

Miles above mouth: 7

Activation Date: October 16, 196.

Sampled by: Illinois Department of Conservation

Field Analysis by: U.S. Public Health Service

Other Cooperating Agencies: Illinois Department of Public Health

Hydrologic Data:

Nearest pertinent gaging station: At Meredosia, Illinois

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 25,300 square miles

Period of record: 1938 to present

Average discharge in record period: 20,250 cfs.

Maximum discharge in record period: 123,000 cfs.

Minimum discharge in record period: 3,060 cfs.

Remarks: Flows include diversions from Lake Michigan through Chicago Sanitary and Ship Canal.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l
3-11-63	0.22
3-20-63	0.19
4- 1-63	0.23
4-15-63	0.29
5- 6-63	0.15
5-20-63	0.20
6-10-63	0.41
6-18-63	0.38
6-26-63	0.24
7- 1-63	0.33
7- 8-63	0.20
7-15-63	0.30
7-22-63	0.25
7-29-63	0.35
8- 5-63	0.32
8-13-63	0.19
8-19-63	0.22
8-26-63	0.16
9- 3-63	0.11
9-11-63	0.28
9-17-63	0.42
9-23-63	0.25

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	1.12	.85
	Na	28	22
	K	5.1	5.3
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	*8	23
	Cd	*4	*4
	As	*38	*35
	B	167	144
	P	399	1750
	Fe	25	61
	Mo	*10	*50
	Mn	*1.9	5
	Al	—	130
	Be	*.1	*.09
	Cu	6	13
	Ag	*.8	*.9
	Ni	*4	*4
	Co	*8	*4
	Pb	*10	*9
	Cr	*2	*9
	V	*4	*18
	Ba	44	51
	Sr	114	193

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	1.8	.5	April to June	–	–
January to March	–	–	July to September	4.4	.5

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.

See page 21.

RADIOACTIVITY DETERMINATIONS

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN ILLINOIS RIVER

STATION LOCATION ILLINOIS RIVER NEAR GRAFTON, ILLINOIS

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						DATE OF DETERMINATION		GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO	DAY	pc/g	±	pc/g	±
10	1	62	11	1	0	1	0	1	-	1	16	10	28	14	44	17						
10	9	62	11	2	1	1	0	1	1	2	11	12	-9	14	17	21						
10	15	62	11	14	1	1	0	1	1	1	8	11	34	14	42	19						
10	23	62	11	21	6	4	1	2	7	4	54	36	17	15	71	39						
10	29	62	11	21	-	-	-	-	-	-	14	7	28	9	42	11						
11	5	62	12	12	1	1	1	2	2	2	5	11	14	14	19	18						
11	13	62	12	3	2	2	0	2	2	3	33	10	25	8	58	13						
11	19	62	12	18	0	1	0	2	0	2	16	12	32	15	48	19						
11	26	62	12	28	-	-	-	-	-	-	21	18	29	15	50	23						
12	4	62	12	31	11	7	0	4	11	8	38	12	42	9	80	15						
12	11	62	1	9	13	15	0	3	13	15	93	62	20	11	113	63						
12	17	62	1	9	2	2	1	2	3	3	13	14	32	14	45	22						
12	23	62	1	14	14	13	5	3	19	13	78	41	19	8	97	42						
1	28	63	2	21	0	0	0	0	0	0	*	7	24	8	32	11						
2	11	63	3	28	5	3	0	1	5	3	215	17	115	8	330	19						
3	20	63	4	22	0	0	0	0	0	0	122	5	93	5	215	7						
4	22	63	6	5*	2	2	0	2	2	3	38	16	56	16	94	23						
5	20	63	7	1*	2	1	0	1	2	2	43	7	74	8	117	11						
6	28	63	7	31*	1	1	1	2	2	2	28	7	42	12	72	17						
7	29	63	8	29*	10	6	0	4	10	7	54	21	32	16	86	28						
8	26	63	10	16*	1	2	1	2	2	3	21	15	34	18	55	23						
9	23	63	11	6*	21	21	0	2	21	21	139	92	24	17	162	93						

PLANKTON POPULATION

STATE ILLINOIS
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN ILLINOIS RIVER
STATION LOCATION ILLINOIS RIVER NEAR GRAFTON, ILLINOIS 098

| DATE OF SAMPLE | | | DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes) | | | | | | | | | FUNGI AND SHEATHED BACTERIA (Number per ml) | MICROINVERTEBRATES | | | | | | | | |

PLANKTON POPULATION

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN ILLINOIS RIVER

STATION LOCATION ILLINOIS RIVER NEAR GRAFTON, ILLINOIS 96

DATE OF SAMPLE			ALGAE (Number per milliliter)										MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																			
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS		INERT DIATOM SHELLS		1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	15200	0	0	1330	0	3690	870	6380	2900	750	120	51	5	67	5	68	4	71	3	88	3	87	3	60	3	38	2	69	2	79	2
10	15	62	9100	50	230	790	50	560	20	950	6440	560	110	79	4	87	4	97	4	88	4	92	2	69	2	52	2	68	2	38	1	17	1
11	5	62	12200	750	20	3020	0	910	0	3500	3970	3640	370	36	4	86	4	71	3	69	3	67	3	51	3	3	3	68	3	40	3	88	3
11	19	62	8800	180	700	2590	0	610	0	4120	590	2320	340	69	4	68	3	38	3	71	3	17	3	26	2	51	2	30	1	52	1	3	1
12	4	62	9300	90	1080	1360	0	1310	50	4550	830	2860	360	71	5	52	3	17	3	38	2	24	2	69	2	87	1	51	1				
12	17	62	15300	90	360	2500	0	650	0	10770	720	6940	270	71	7	45	3	52	3	92	2	24	2	26	2	68	2	17	2	38	2		
1	7	63	49300	0	180	450	0	1210	0	47250	160	1790	50	71	9	59	3	26	2	91	2	69	2	17	1	52	1						
3	11	63	3600	0	0	200	0	1890	1410	40	70	90	90	54	4	65	4	65	1	51	1	44	1										
4	1	63	1900	0	0	20	0	240	730	950	0	220	70	71	3	60	3	52	1														
4	15	63	1500	0	40	250	0	170	290	170	570	250	590	92	2	65	1																
5	6	63	2900	20	20	2160	0	350	40	130	220	180	290	24	4	25	1	38	1	52	1	51	1										
5	20	63	2100	90	20	260	0	750	40	620	290	310	180	52	3	71	2	69	1	88	1												
6	18	63	8900	410	0	1360	0	2460	20	4110	570	540	110	71	5	52	4	68	4	51	3	38	3	3	2	25	1	88	1	59	1	69	1
7	1	63	7700	90	230	3370	0	2920	50	880	160	110	70	51	4	38	4	44	3	68	3	57	3	25	3	59	1						
7	15	63	13200	240	0	3760	0	3300	290	4910	730	200	20	68	5	25	4	52	3	51	3	38	2	40	2	26	2	24	2	57	2	44	1
8	5	63	3300	80	100	1430	0	80	0	910	680	310	350	38	3	68	2	24	2	88	2	69	1	35	1								
8	19	63	6700	410	90	3570	0	500	0	1870	190	660	240	66	4	38	3	34	3	44	2	71	2	25	1	24	1	44	1	45	1	3	1
9	3	63	2000	0	90	780	0	110	0	710	340	450	220	38	2	69	1																
9	17	63	8000	160	160	1800	0	4390	-	900	430	320	160	54	5	38	3	67	2	57	2	68	2	44	1	88	1	52	1	15	1		

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE ILLINOIS
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN ILLINOIS RIVER
STATION LOCATION ILLINOIS RIVER NEAR GRAFTON, ILLINOIS

90

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	29	62	11	6	4658	242	81	161	1	21	26	1	1	24	0	11	9	2	11
11	26	62	12	4	7842	211	63	148	1	11	26	1	1	23	1	10	5	1	9
12	15	62	12	28	1896	559	112	447	3	27	46	2	2	42	0	14	7	2	11

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN ILLINOIS RIVER

STATION LOCATION ILLINOIS RIVER NEAR GRAFTON, ILLINOIS

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	22	63	-	-	-	-	-	-	-	-	30	146	240	5	650	55	.4	330	-
8	5	63	-	-	-	-	-	-	-	-	38	132	240	10	*25	105	.7	360	-
8	13	63	-	-	-	-	-	-	-	-	40	120	220	0	*25	98	.2	450	-
8	19	63	-	-	-	-	-	-	-	-	30	140	240	5	*25	85	.4	436	-
8	26	63	-	-	-	-	-	-	-	-	33	122	210	5	*25	85	.1	320	-
9	3	63	-	-	-	-	-	-	-	-	32	130	240	5	350	88	.3	340	-
9	11	63	-	-	-	-	-	-	-	-	38	156	230	10	*25	95	.2	380	-
9	16	63	-	-	-	-	-	-	-	-	35	148	230	-	*25	95	.1	350	-
9	23	63	-	-	-	-	-	-	-	-	42	160	240	5	60	105	.1	390	-

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Meredosia, Illinois
Operated by U.S. Geological Survey

STATE Illinois

MAJOR BASIN Upper Mississippi River

MINOR BASIN Illinois River

STATION LOCATION Illinois River near Grafton, Illinois

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	7.200	6.440	7.120	5.000	3.500	4.000	23.600	17.600	10.700	6.420	10.600	6.100
2	7.540	6.900	6.960	5.200	3.500	4.500	23.400	17.600	10.400	6.300	10.400	6.180
3	8.640	6.900	6.450	5.600	3.500	5.000	22.900	18.800	10.500	6.040	9.240	6.580
4	9.240	6.930	6.400	6.200	4.000	15.000	22.800	18.900	9.900	6.100	7.900	6.340
5	7.560	6.480	7.390	6.340	4.500	30.800	22.400	21.000	9.900	5.820	7.220	6.580
6	7.040	5.960	7.750	6.740	4.500	33.700	22.300	21.500	9.470	6.040	9.380	6.160
7	7.740	6.450	7.700	6.680	4.500	36.600	21.700	20.000	9.480	6.730	10.200	5.280
8	7.360	6.840	7.560	6.600	5.220	39.800	21.500	20.900	10.000	6.320	8.550	6.180
9	6.640	6.760	7.600	6.600	5.160	41.000	19.800	20.900	10.500	5.940	7.560	6.240
10	6.530	6.690	6.090	6.000	4.640	40.500	19.000	19.600	10.900	6.820	7.820	6.070
11	6.200	6.890	5.600	5.400	4.500	39.800	18.400	17.700	11.200	7.620	8.180	5.350
12	5.900	7.300	5.000	5.000	4.300	39.500	16.900	18.500	11.300	7.500	8.120	5.040
13	6.100	6.560	4.500	5.000	4.200	39.300	15.900	17.900	11.200	8.720	8.720	6.080
14	6.290	6.520	4.000	5.000	4.000	38.600	14.500	17.700	10.900	9.970	7.560	6.150
15	6.340	6.300	4.000	5.500	4.000	37.900	12.400	16.900	11.200	9.160	7.600	4.970
16	5.780	6.200	4.200	5.500	4.000	36.800	12.000	14.300	11.100	9.100	7.960	4.810
17	5.420	7.050	4.700	5.000	4.000	35.700	12.000	12.200	11.000	8.750	7.830	5.800
18	5.190	7.570	5.400	4.700	4.000	34.800	12.100	12.800	10.200	8.580	7.550	5.480
19	5.380	8.040	6.000	4.300	4.000	34.200	11.700	13.200	9.680	9.270	7.940	5.860
20	6.870	8.280	7.000	4.000	4.000	34.100	11.500	13.100	9.650	10.400	7.260	5.580
21	8.680	7.880	7.000	3.500	4.000	34.100	12.100	13.700	9.010	10.200	7.160	5.000
22	8.800	8.100	7.000	3.500	4.000	33.400	12.000	13.300	7.950	9.960	7.680	4.800
23	8.500	7.800	6.400	3.500	4.000	32.300	11.800	13.100	7.440	12.600	7.760	4.740
24	8.550	7.330	6.000	3.500	4.000	31.100	11.600	12.500	7.240	14.300	7.680	5.290
25	8.550	7.560	5.600	3.500	4.000	30.200	11.700	11.700	7.200	14.400	6.880	5.160
26	8.920	7.080	5.200	3.500	4.000	29.900	11.900	11.400	7.020	13.300	5.800	5.050
27	8.780	7.080	5.000	3.500	4.000	29.200	12.100	11.200	6.920	12.100	7.180	4.770
28	7.790	7.200	5.000	3.500	4.000	27.400	11.400	11.000	6.840	11.600	6.710	4.970
29	6.920	6.800	5.000	3.500		26.600	12.200	11.100	6.400	11.400	6.740	5.240
30	6.700	6.620	5.000	3.500		25.400	16.800	11.000	6.500	11.100	6.080	5.700
31	6.470		5.000	3.500		23.900		11.000		10.800	6.230	

ILLINOIS RIVER AT PEORIA, ILLINOIS

This station is located approximately halfway between Chicago and the point where the Illinois River empties into the Mississippi River. Samples are taken from the municipal water plant intake. Municipal and industrial discharges from the Chicago metropolitan area are diverted, with dilution water from Lake Michigan, through the Chicago Sanitary and Ship Canal System to the Illinois River. Although essentially all of the municipal wastes receive secondary treatment so that about 90% of the BOD is removed, a BOD population equivalent of about 1,170,000 is still discharged to the river or its tributaries above this station.

The waste loadings on this river are reflected in phosphorus concentrations which are among the highest observed throughout the PHS Water Pollution Surveillance System. Similarly, ABS concentrations were high and on four occasions (14% of the time) exceeded the recommended PHS Drinking Water Standards level of 0.5 mg/l.

Station Location: Illinois River at Peoria, Illinois

Major Basin: Upper Mississippi River

Minor Basin: Illinois River

Station at: 40°44' Latitude 89°33' Longitude

Miles above mouth: 166

Activation Date: March 31, 1960

Sampled by: Peoria Water Works Company

Field Analysis by: Peoria Water Works Company

Other Cooperating Agencies: Illinois Department of Public Health

Hydrologic Data:

Nearest pertinent gaging station: Kingston Mines Illinois

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 15,200 square miles

Period of record: 1939 to present

Average discharge in record period: 13,840 cfs.

Maximum discharge in record period: 83,100 cfs.

Minimum discharge in record period: 2,300 cfs.

Remarks: Occasional low flow regulation by operation of navigation dams. Flows include diversions from Lake Michigan through Chicago Sanitary and Ship Canal.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l
3- 4-63	0.52
3-11-63	0.21
3-18-63	0.20
3-25-63	0.27
4- 1-63	0.25
4- 8-63	0.50
4-15-63	0.60
4-22-63	0.34
4-29-63	0.10
5- 6-63	0.15
5-13-63	-.15
5-20-63	0.22
5-27-63	0.35
6- 3-63	0.17
6-10-63	0.22
6-17-63	0.37
6-24-63	0.39
7- 1-63	0.56
7- 8-63	0.37
7-15-63	0.49
7-22-63	0.45
7-29-63	0.35
8- 5-63	0.28
8-19-63	0.30
8-26-63	0.24
9- 3-63	0.15
9- 9-63	0.47
9-30-63	0.48

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	1.13	1.15
	Na	36	26
	K	5.6	5.5
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	10	10
	Cd	*4	*4
	As	*39	*40
	B	118	170
	P	784	**1980
	Fe	12	10
	Mo	*8	*50
	Mn	.8	*2
	Al	—	*20
	Be	*.1	*.1
	Cu	8	10
	Ag	*.8	*1
	Ni	4	*4
	Co	*8	*4
	Pb	*20	*10
	Cr	*2	*10
	V	*4	*20
	Ba	31	26
	Sr	131	232

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	1.7	.4	April to June	3.5	.3
January to March	—	—	July to September	—	—

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN ILLINOIS RIVER

STATION LOCATION ILLINOIS RIVER AT PEORIA, ILLINOIS

67

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER														RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						DATE OF DETERMINATION		GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO	DAY	pc/g	±	pc/g	±
10	1	62	10	23	-	-	-	-	-	-	30	11	37	15	67	19						
10	8	62	11	2	-	-	-	-	-	-	6	12	17	14	23	18						
10	15	62	11	1	-	-	-	-	-	-	5	12	22	15	27	19						
10	22	62	11	9	1	1	0	1	1	1	16	11	21	14	37	18						
10	29	62	11	17	-	-	-	-	-	-	11	12	22	15	33	19						
11	26	62	12	21*	1	1	1	2	2	2	5	12	24	15	29	19						
12	31	62	1	16*	0	1	0	1	0	1	11	13	19	16	30	21						
1	28	63	2	20*	1	1	3	2	4	2	28	14	17	17	45	22						
2	25	63	3	18*	1	1	5	3	6	3	7	6	24	8	31	10						
3	25	63	4	15*	1	2	2	1	3	2	143	16	103	17	246	23						
4	29	63	5	24*	2	2	0	2	2	2	36	14	53	16	89	21						
5	27	63	6	7*	1	1	0	2	1	2	20	14	61	17	81	22						
6	24	63	7	3*	0	1	1	2	1	2	4	12	47	16	51	20						
7	29	63	8	21*	0	1	0	2	0	2	16	12	34	16	50	20						
8	26	63	10	1*	0	1	2	3	2	3	5	6	45	10	50	12						
9	30	63	10	31*	0	1	0	1	0	1	3	12	37	16	40	20						

PLANKTON POPULATION

STATE ILLINOIS
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN ILLINOIS RIVER
STATION LOCATION ILLINOIS RIVER AT PEORIA, ILLINOIS 067

| DATE OF SAMPLE | | | DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes) | | | | | | | | | FUNGI AND SHEATHED BACTERIA Number per ml | MICROINVERTEBRATES | | | | | | | | |

PLANKTON POPULATION

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN ILLINOIS RIVER

STATION LOCATION ILLINOIS RIVER AT PEORIA, ILLINOIS

67

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	69200	550	210	14900	*	830	0	21860	22660	12870	4560	71	7	68	7	88	7	50	6	40	6	87	6	38	5	69	3	24	3	51	3
10	15	62	8100	70	180	1690	0	770	0	2790	2590	630	290	68	4	69	3	51	3	87	3	38	2	92	2	26	2	88	2	27	2	71	2
11	5	62	15800	180	560	4370	0	1670	50	7380	1640	2030	1150	71	5	69	5	38	4	26	4	51	4	92	3	17	2	24	2	35	2	68	1
11	19	62	16600	140	360	1890	0	990	90	12200	950	990	810	52	3	69	3	38	3	68	2	71	2	26	2	17	2	24	1	87	1	41	1
12	3	62	26100	0	410	860	0	1670	140	22550	450	2750	180	71	7	68	6	52	3	51	2	69	2	26	2	17	1	25	1				
12	17	62	17000	0	40	320	0	770	0	15570	270	2480	860	71	6	68	5	67	2	17	2	51	1	52	1								
1	8	63	2000	0	0	20	0	200	40	1650	40	570	110	71	3	68	3	51	1														
1	21	63	4500	0	20	130	0	260	0	4070	40	290	40	71	5	68	4																
2	4	63	600	0	0	20	0	20	0	550	20	40	20	71	2																		
2	18	63	400	0	0	20	0	90	150	130	10	70	70	60	1																		
3	4	63	400	0	0	0	0	110	70	240	20	70	110	68	1																		
3	18	63	1800	0	20	90	0	200	70	680	700	550	440	68	2	88	1	52	1														
4	1	63	7600	20	0	440	0	200	150	6340	440	1580	480	71	6	68	4	88	2	65	1												
4	15	63	48500	80	500	8270	0	2650	460	35320	1210	3440	760	71	8	68	6	38	4	34	4	51	4	24	4	25	4	52	3	26	3	69	3
5	6	63	7200	40	70	1470	0	730	0	3960	970	1410	550	71	5	68	3	38	3	52	2	92	1	51	1	88	1	25	1	34	1	69	1
5	20	63	8900	130	90	4800	0	1250	0	1740	880	1410	460	24	4	38	3	71	3	52	3	69	2	51	2	25	2	34	2	26	2	92	1
6	3	63	33900	420	640	16020	0	2510	20	10800	3520	2490	1060	24	6	69	6	68	5	88	4	71	4	51	4	26	4	38	4	35	3	25	3
6	17	63	68400	270	140	5740	0	7250	50	43560	11350	3650	720	68	9	86	6	51	6	69	5	24	4	38	4	52	3	35	2	3	1	37	1
7	1	63	21000	80	440	9370	0	190	20	6810	4100	2050	390	71	5	88	5	68	4	38	4	24	3	35	2	22	2	37	1	25	1	30	1
7	15	63	5500	20	60	2960	0	150	0	1200	1160	390	150	38	4	88	3	35	3	68	2	69	2	24	1								
8	5	63	15800	830	1200	3750	0	2440	1180	3400	3000	2690	1160	68	5	38	4	88	4	52	3	65	3	15	3	3	3	51	2	24	2	71	2
8	19	63	21500	160	50	4340	0	3370	70	7350	6170	2440	1700	88	6	68	6	51	4	38	4	69	3	52	3	35	3	24	3	71	3	32	1
9	3	63	23700	90	70	6780	0	1360	0	12410	2920	8600	3290	68	6	69	5	88	4	38	4	24	4	71	4	67	4	34	3	51	2	35	2
9	16	63	42600	230	320	6220	0	1730	20	26370	740	5180	1370	68	7	88	6	71	6	69	5	38	5	24	3	51	3	25	3	52	2	67	2
10	1	62				* 8230																											

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN ILLINOIS RIVER

STATION LOCATION ILLINOIS RIVER AT PEORIA, ILLINOIS

67

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
11	3	62	11	13	5118	318	93	229	1	16	46	2	2	41	1	13	6	3	8
1	8	63	1	18	4991	368	89	279	4	17	40	3	3	33	1	12	7	3	6
3	25	63	4	1	5033	309	79	230	1	10	47	3	3	37	4	8	3	2	8
6	3	63	6	17	4593	436	210	226	7	43	77	7	7	62	1	30	32	4	17
7	1	63	7	8	2934#	524	256	268	11	55	90	9	6	68	7	38	32	5	25
7	29	63	8	8	4944	305	173	132	4	30	71	6	6	55	4	27	22	4	15
9	3	63	9	11	4981	325	119	206	3	22	52	4	4	41	3	19	9	3	11

ESTIMATED

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE ILLINOIS
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN ILLINOIS RIVER
STATION LOCATION ILLINOIS RIVER AT PEORIA, ILLINOIS

67

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	8	62	18.8	6.1	7.5	-	-	-	-	-	38	150	236	25	90	-	-	-	280
10	22	62	17.6	5.0	7.5	-	-	-	-	-	38	148	232	25	80	-	-	-	7500
11	5	62	9.5	10.3	7.7	-	-	-	-	-	38	164	269	25	130	-	-	-	330
11	19	62	8.6	10.3	7.7	-	-	-	-	-	38	162	252	25	80	-	-	-	170
11	26	62	7.2	12.0	7.9	-	-	-	-	-	39	164	256	30	120	-	-	-	230
12	3	62	9.2	14.2	7.9	-	-	-	-	-	41	168	258	20	55	-	-	-	500
12	17	62	2.4	15.8	7.8	-	-	-	-	-	41	178	272	25	65	-	-	-	100
1	8	63	1.7	14.4	7.8	-	-	-	-	-	40	174	252	15	70	-	-	-	250
1	16	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180
1	28	63	1.9	12.3	7.3	-	-	-	-	-	40	200	282	15	12	-	-	-	150
2	18	63	1.2	11.7	7.2	-	-	-	-	-	57	196	266	20	90	-	-	-	190
2	25	63	1.4	11.7	7.2	-	-	-	-	-	-	190	266	25	100	-	-	-	1800
3	11	63	3.0	9.1	7.2	-	-	-	-	-	24	94	152	70	170	-	-	-	-
3	18	63	5.2	11.1	7.3	-	-	-	-	-	33	102	186	60	160	-	-	-	11000
3	25	63	9.6	10.6	7.6	-	-	-	-	-	43	150	258	30	160	-	-	-	650
4	1	63	17.8	7.7	7.6	-	-	-	-	-	36	164	292	25	100	-	-	-	330
4	8	63	14.4	8.2	7.6	-	-	-	-	-	37	170	300	25	140	-	-	-	400
4	15	63	14.5	13.5	8.3	-	-	-	-	-	39	170	298	20	120	-	-	-	500
4	22	63	16.2	6.2	7.6	-	-	-	-	-	38	166	266	20	95	-	-	-	500
4	29	63	17.1	9.5	8.0	-	-	-	-	-	37	156	260	15	100	-	-	-	330
5	6	63	17.6	8.1	7.5	-	-	-	-	-	29	150	252	20	110	-	-	-	4800
5	13	63	17.7	6.3	7.6	-	-	-	-	-	37	166	310	20	160	-	-	-	-
5	20	63	18.1	6.2	7.7	-	-	-	-	-	37	166	280	20	150	-	-	-	-
5	27	63	19.3	8.4	8.0	-	-	-	-	-	36	166	302	15	100	-	-	-	650
6	3	63	23.7	12.7	8.2	-	-	-	-	-	37	156	258	20	85	-	-	-	5500
6	10	63	27.1	5.5	7.9	-	-	-	-	-	35	150	250	25	110	-	-	-	-
6	17	63	24.5	13.2	8.4	-	-	-	-	-	33	150	254	20	110	-	-	-	-
6	24	63	24.3	12.2	8.3	-	-	-	-	-	36	154	250	20	95	-	-	-	3000
7	1	63	29.0	5.2	8.4	-	-	-	-	-	38	150	238	25	60	-	-	-	2500
7	8	63	25.0	4.5	8.2	-	-	-	-	-	38	158	242	25	75	-	-	-	400
7	15	63	24.5	2.3	8.1	-	-	-	-	-	42	156	232	25	60	-	-	-	400
7	29	63	27.0	4.0	7.8	-	-	-	-	-	33	140	244	25	65	-	-	-	1000
8	5	63	27.3	5.6	8.0	-	-	-	-	-	32	138	246	25	50	-	-	-	190
8	19	63	22.4	6.8	7.9	-	-	-	-	-	42	152	268	20	60	-	-	-	900
8	26	63	24.2	5.9	8.1	-	-	-	-	-	42	152	260	25	45	-	-	-	50
9	3	63	23.7	6.1	8.0	-	-	-	-	-	42	154	246	25	75	-	-	-	300
9	9	63	22.7	15.2	8.6	-	-	-	-	-	43	152	244	20	60	-	-	-	290
9	16	63	20.3	14.2	8.4	-	-	-	-	-	45	148	246	20	55	-	-	-	130
9	23	63	20.3	9.3	8.4	-	-	-	-	-	42	150	254	20	65	-	-	-	820
9	30	63	18.9	8.3	8.5	-	-	-	-	-	48	146	246	15	70	-	-	-	100

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Kingston Mines, Illinois
Operated by U.S. Geological Survey

STATE	Illinois
MAJOR BASIN	Upper Mississippi River
MINOR BASIN	Illinois River
STATION LOCATION	Illinois River at Peoria, Illinois

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	4.680	5.660	5.180	4.200	3.000	3.200	11.500	19.100	8.580	5.220	8.570	3.930
2	4.580	4.900	4.720	4.250	3.000	3.500	11.000	16.800	7.850	5.100	7.380	4.100
3	5.550	4.330	4.580	4.520	3.000	4.500	12.000	13.100	7.200	4.870	6.570	3.990
4	4.950	4.640	6.010	4.520	3.300	7.250	11.400	14.600	6.870	5.060	6.120	3.990
5	4.860	4.950	6.650	5.210	3.600	18.000	11.200	19.200	6.400	4.490	6.020	3.860
6	4.860	5.460	6.450	5.400	4.000	21.100	11.500	21.500	6.720	4.100	6.540	4.490
7	4.720	5.660	6.250	5.020	4.000	24.300	12.000	20.200	6.420	4.460	6.190	3.190
8	4.940	5.510	5.940	4.920	3.800	25.800	10.500	18.000	7.100	4.240	6.420	3.090
9	5.180	5.680	6.010	4.490	3.600	27.200	10.800	16.200	7.250	3.710	6.420	3.790
10	4.940	5.840	5.370	4.360	3.500	28.100	12.200	12.000	7.100	4.280	6.060	3.990
11	5.060	5.220	5.200	3.950	3.400	28.100	12.100	11.400	7.100	4.180	5.820	3.500
12	4.940	5.510	4.800	3.420	3.300	28.200	9.140	11.300	8.050	4.040	5.630	3.090
13	4.560	5.460	4.500	3.500	3.300	28.400	5.300	10.500	8.050	3.910	5.440	4.080
14	4.420	5.320	4.200	3.500	3.300	27.200	8.040	9.820	8.050	4.580	5.500	4.010
15	4.680	4.540	3.660	3.800	3.300	25.900	8.000	8.000	8.460	4.800	5.250	4.000
16	4.990	4.850	3.570	4.200	3.400	24.700	7.610	7.550	7.850	5.300	5.180	4.000
17	4.990	5.740	3.160	4.000	3.700	24.200	7.250	8.000	7.240	5.700	4.680	4.000
18	4.920	5.880	3.960	3.600	4.000	23.800	7.380	8.670	7.150	6.060	5.060	4.100
19	5.230	5.680	4.280	3.300	3.800	23.200	8.100	8.710	6.500	6.770	5.060	4.300
20	6.000	5.530	4.510	3.000	3.600	23.200	7.960	8.570	5.970	7.740	4.680	4.500
21	7.400	5.460	5.660	3.000	3.400	23.000	7.810	8.670	5.880	8.300	4.510	4.000
22	7.200	5.880	6.010	3.000	3.300	21.400	7.850	8.200	5.630	11.800	4.840	4.000
23	7.200	5.880	5.630	3.000	3.200	20.400	7.900	8.480	5.240	14.200	4.400	4.330
24	7.300	5.500	5.310	3.000	3.200	19.300	7.550	8.480	5.500	14.600	4.070	4.650
25	7.590	5.360	4.800	3.000	3.200	19.400	7.520	8.290	5.240	14.400	4.070	4.500
26	7.380	4.920	4.500	3.000	3.200	18.900	7.370	7.950	4.590	12.900	4.510	4.300
27	6.720	5.180	4.200	3.000	3.200	18.200	7.520	8.100	4.560	10.700	4.370	4.400
28	5.800	5.440	4.200	3.000	3.200	17.400	7.470	8.100	4.680	10.000	4.630	4.400
29	5.750	5.310	4.200	3.000		14.100	7.400	8.200	4.940	9.900	4.280	4.440
30	5.460	5.180	4.200	3.000		12.100	14.100	8.050	4.740	9.700	4.340	3.780
31	5.560		4.200	3.000		11.800		7.910		9.180	4.200	

MISSISSIPPI RIVER AT CAPE GIRARDEAU, MISSOURI

Samples are taken at Missouri Utilities Company plants. Most of the analyses are made on waters from the municipal water plant intake located approximately 53 miles upstream from the mouth of the Ohio River. Two miles downstream (river mile 1018) the carbon filter unit samples from the cooling water intake for the power plant.

The metropolitan St. Louis, Missouri area, approximately 125 river miles upstream, discharges untreated wastes having an estimated BOD population equivalent of 3.8 million for which primary treatment is being planned.

The December 3, 1962 sample indicated a sharp rise in plankton population at Cape Girardeau with total counts of 53,775 algal organisms per milliliter and significant numbers of predatory rotifers. Algal counts decreased to about 6,000 per ml. in samples collected December 17 and January 7.

Bottom samples were collected from the muddy bottom between two jettys across from the city on May 16 and August 13, 1963. Small oligochaete worms averaging less than 100 individuals per square foot were the only animals present in the May samples. Midge larvae were present in the August samples. It is possible that the high water of March and April 1963, flushed out the older deposits and the larvae had not yet been able to become established in the newer sediments.

736-497 O - 64 - 4

Station Location: Mississippi River at Cape Girardeau, Missouri

Major Basin: Upper Mississippi River

Minor Basin: Mississippi River at Cape Girardeau, Missouri

Station at: 37°19' Latitude 89°31' Longitude

Miles above mouth: 1020

Activation Date: January 6, 1958

Sampled by: Missouri Utilities Company

Field Analysis by: Missouri Utilities Company

Other Cooperating Agencies: Missouri Department of Public Health
Missouri Water Pollution Board

Hydrologic Data:

Nearest pertinent gaging station: At Thebes, Illinois

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 717,200 square miles

Period of record: 1932 to present

Average discharge in record period: 180,600 cfs.

Maximum discharge in record period: 893,000 cfs.

Minimum discharge in record period: 23,400 cfs.

Remarks: Flows affected by operation of reservoirs and navigation dams in Upper Mississippi River basin and by reservoir operations and irrigation diversions in Missouri basin.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.23	.50
	Na	30	20
	K	5.0	5.7
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	10	3
	Cd	*3	*3
	As	*32	*30
	B	47	53
	P	*16	26
	Fe	23	39
	Mo	13	23
	Mn	*.7	*1.5
	Al	—	15
	Be	*.08	*.08
	Cu	7	*2
	Ag	*.7	*.8
	Ni	*2	*3
	Co	*7	*3
	Pb	16	*8
	Cr	*2	*8
	V	*3	*15
	Ba	86	69
	Sr	111	132

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	2.7	.4	April to June	—	—
January to March	—	—	July to September	5.3	.4

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l
8/5 - 8/19/63	Endrin	.007
8/5 - 8/19/63	Dieldrin	.005
9/3 - 9/11/63	Endrin	*.001
9/3 - 9/11/63	Dieldrin	.003

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE MISSOURI

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-CAPE GIRARDEAU AREA

STATION LOCATION MISSISSIPPI RIVER AT CAPE GIRARDEAU, MISSOURI 23

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL		ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO DAY	pc/g	±	pc/g	±
10	1	62	10	30	4	4	3	2	7	4	63	31	34	14	97	34					
10	8	62	10	31	-	-	-	-	-	-	96	41	17	8	113	42					
10	15	62	11	14	-	-	-	-	-	-	56	30	24	8	80	31					
10	22	62	12	?	-	-	-	-	-	-	32	9	31	9	63	10					
10	29	62	11	??	-	-	-	-	-	-	40	12	4	10	44	16					
11	26	62	12	12?	1	1	2	2	3	2	20	13	48	15	68	20					
12	31	62	1	16?	4	1	2	2	6	2	21	15	24	16	45	22					
1	28	63	2	20?	1	1	4	3	5	3	0	14	31	17	31	22					
2	25	63	3	11?	1	1	1	2	2	2	7	10	23	12	30	16					
3	25	63	4	17?	10	8	2	1	12	8	150	45	35	9	185	46					
4	29	63	5	17?	3	3	2	2	4	3	47	16	61	10	108	19					
5	27	63	6	13?	8	8	4	3	12	9	233	75	65	16	298	77					
6	24	63	7	17?	4	6	2	2	6	6	55	68	39	10	94	69					
7	29	63	8	16?	19	8	4	2	23	9	83	23	36	15	119	27					
8	26	63	9	22?	3	4	1	2	4	4	29	16	36	7	65	17					
9	30	63	10	22?	1	2	3	3	4	4	14	9	44	11	58	14					

PLANKTON POPULATION

STATE MISSOURI

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-CAPE GIRARDEAU AREA

STATION LOCATION MISSISSIPPI RIVER AT CAPE GIRARDEAU, MISSOURI 023

| DATE OF SAMPLE | | | DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes) | | | | | | | | | | FUNGI AND SHEATHED BACTERIA (Number per ml.) | MICROINVERTEBRATES | | | | | | | | | |

PLANKTON POPULATION

STATE MISSOURI

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-CAPE GIRARDEAU AREA

STATION LOCATION MISSISSIPPI RIVER AT CAPE GIRARDEAU, MISSOURI

23

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	5800	40	0	360	0	0	0	3380	2070	1390	1690	71	4	69	3	68	3	88	2	87	1	97	1	89	1	82	1	24	1	92	1
10	15	62	6000	0	40	680	120	210	20	3730	1160	1490	330	69	4	71	4	68	3	38	2	88	1	92	1	24	1	87	1	51	1		
11	5	62	3900	0	50	680	0	230	0	2180	740	2050	340	71	3	69	3	88	2	38	1	97	1	51	1								
11	21	62	4700	70	180	580	0	180	0	3150	540	6910	290	69	4	71	4	38	1	24	1												
12	3	62	55900	50	320	830	0	170	110	53780	630	64580	540	71	8	69	7	68	2	24	2	77	2	17	1	38	1						
12	17	62	6200	20	310	730	0	370	0	4140	640	6860	350	71	5	24	2	69	1	88	1	17	1	38	1	57	1						
1	7	63	7700	0	130	180	0	220	0	6800	330	380	220	71	5	77	1																
1	21	63	13000	0	180	180	0	0	0	12290	320	2480	230	71	7	77	1																
2	4	63	7600	0	0	70	0	180	0	7150	240	990	20	71	6	77	1																
2	18	63	1800	0	0	70	0	40	200	1230	220	460	70	71	4	77	1																
3	4	63	4200	20	180	90	0	180	180	3230	370	480	240	71	5	77	1	17	1	51	1	65	1										
3	18	63	1300	0	0	0	0	70	0	700	550	220	460	71	3	88	1	77	1														
4	1	63	1600	0	20	0	0	70	0	1210	290	570	420	71	3																		
4	15	63	9000	0	60	500	0	290	250	7350	500	2900	420	71	6	51	1	38	1	65	1	69	1	88	1								
5	6	63	3500	0	110	310	0	230	0	2510	370	2790	660	24	1																		
5	20	63	2800	0	20	420	0	110	0	1780	440	2240	790	38	1	24	1																
6	3	63	3200	0	50	590	0	40	0	1620	860	670	340	71	3	77	2	38	1	88	1	24	1	87	1								
6	17	63	200	0	0	0	0	0	0	180	70	220	420																				
7	1	63	1600	20	20	570	0	40	0	350	570	420	90	38	1	77	1																
7	15	63	900	0	0	80	0	0	0	750	60	600	210																				
8	5	63	5700	70	20	570	0	90	0	4400	590	2020	180	69	5	35	1																
8	19	63	*	-	-	-	-	-	-	-	-	-	-																				
9	2	63	1700	0	0	480	0	70	0	810	310	330	110	69	2	68	1	71	1														
9	11	63	1700	0	20	600	0	310	0	420	340	1380	580	38	2	68	1																

* TOO TURBID TO COUNT

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE MISSOURI

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-CAPE GIRARDEAU AREA

STATION LOCATION MISSISSIPPI RIVER AT CAPE GIRARDEAU, MISSOURI

23

DATE OF SAMPLE BEGINNING			DATE OF SAMPLE END		GALLONS FILTERED	EXTRACTABLES			CHLOROFORM EXTRACTABLES										
											NEUTRALS								
MONTH	DAY	YEAR	MONTH	DAY		TOTAL	CHLORO-FORM	ALCOHOL	ETHER INSOLUBLES	WATER SOLUBLES	TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	2	62	10	15	2655	312	138	174	1	31	37	2	4	31	0	24	12	3	30
11	5	62	11	19	3503	299	74	225	1	14	29	2	2	24	1	12	4	2	12
12	5	62	12	17	2355	480	136	344	3	27	60	2	4	54	0	22	8	3	13
1	7	63	1	21	4470	292	80	212	2	11	42	3	6	31	2	13	3	2	7
2	9	63	2	18	2565	443	128	315	3	18	63	6	6	40	11	15	6	3	20
6	3	63	6	17	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	1	63	7	15	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	5	63	8	19	4102	172	58	114	1	11	22	1	1	18	2	9	5	1	9
9	3	63	9	11	5810	124	49	75	2	11	16	1	1	13	1	8	5	1	6

* FLOW UNKNOWN

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MISSOURI

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-CAPE GIRARDEAU AREA

STATION LOCATION MISSISSIPPI RIVER AT CAPE GIRARDEAU, MISSOURI 23

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	1	62	20.0	-	7.8	-	-	-	-	-	19	158	180	-	220	-	-	-	-
10	8	62	20.0	-	7.7	-	-	-	-	-	16	132	174	-	300	-	-	-	-
10	15	62	21.5	-	7.7	-	-	-	-	-	17	126	176	-	250	-	-	-	-
10	22	62	20.0	-	7.7	-	-	-	-	-	14	120	176	-	220	-	-	-	-
10	29	62	15.0	-	7.8	-	-	-	-	-	20	134	202	-	220	-	-	-	-
11	5	62	11.5	-	7.7	-	-	-	-	-	20	130	208	-	180	-	-	-	-
11	13	62	10.0	-	7.7	-	-	-	-	-	19	156	222	-	120	-	-	-	-
11	19	62	10.0	-	7.7	-	-	-	-	-	20	166	220	-	120	-	-	-	-
11	26	62	8.0	-	7.7	-	-	-	-	-	21	174	220	-	140	-	-	-	-
12	3	62	8.0	-	7.7	-	-	-	-	-	21	188	222	-	140	-	-	-	-
12	10	62	6.5	-	7.7	-	-	-	-	-	23	200	224	-	140	-	-	-	-
12	17	62	2.5	-	7.7	-	-	-	-	-	28	220	250	-	140	-	-	-	-
12	24	62	4.0	-	7.7	-	-	-	-	-	24	200	238	-	140	-	-	-	-
12	31	62	4.0	-	7.8	-	-	-	-	-	29	194	250	-	180	-	-	-	-
1	7	63	3.0	-	7.8	-	-	-	-	-	27	194	236	-	140	-	-	-	-
1	14	63	2.5	-	7.9	-	-	-	-	-	28	202	246	-	120	-	-	-	-
1	21	63	3.0	-	7.9	-	-	-	-	-	25	200	236	-	120	-	-	-	-
1	28	63	1.5	-	7.7	-	-	-	-	-	23	194	250	-	80	-	-	-	-
2	4	63	3.0	-	7.5	-	-	-	-	-	26	184	264	-	80	-	-	-	-
2	11	63	3.0	-	7.5	-	-	-	-	-	30	201	256	-	120	-	-	-	-
2	18	63	3.0	-	7.5	-	-	-	-	-	29	158	240	-	120	-	-	-	-
2	25	63	2.0	-	7.5	-	-	-	-	-	28	180	214	-	120	-	-	-	-
3	4	63	5.0	-	7.5	-	-	-	-	-	29	184	230	-	120	-	-	-	-
3	11	63	5.0	-	7.5	-	-	-	-	-	17	110	144	-	1060	-	-	-	-
3	18	63	8.0	-	7.5	-	-	-	-	-	18	114	148	-	720	-	-	-	-
3	25	63	8.0	-	7.5	-	-	-	-	-	10	114	150	-	540	-	-	-	-
4	1	63	11.0	-	7.5	-	-	-	-	-	16	120	150	-	420	-	-	-	-
4	8	63	14.0	-	7.6	-	-	-	-	-	15	126	156	-	500	-	-	-	-
4	15	63	15.0	-	7.5	-	-	-	-	-	17	130	170	-	180	-	-	-	-
4	22	63	18.5	-	8.0	-	-	-	-	-	17	138	186	-	180	-	-	-	-
4	29	63	18.5	-	7.9	-	-	-	-	-	17	130	180	-	180	-	-	-	-
5	6	63	17.0	-	7.7	-	-	-	-	-	19	132	182	-	420	-	-	-	-
5	13	63	23.0	-	7.5	-	-	-	-	-	18	132	180	-	280	-	-	-	-
5	20	63	21.0	-	7.5	-	-	-	-	-	10	124	172	-	580	-	-	-	-
5	27	63	21.0	-	7.5	-	-	-	-	-	14	120	160	-	720	-	-	-	-
6	3	63	22.0	-	7.5	-	-	-	-	-	12	112	152	-	420	-	-	-	-
6	10	63	-	-	7.7	-	-	-	-	-	16	130	154	-	220	-	-	-	-
6	17	63	25.5	-	7.7	-	-	-	-	-	15	120	140	-	1380	-	-	-	-
6	24	63	26.0	-	7.7	-	-	-	-	-	20	116	184	-	380	-	-	-	-

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MISSOURI

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-CAPE GIRARDEAU AREA

STATION LOCATION MISSISSIPPI RIVER AT CAPE GIRARDEAU, MISSOURI 23

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	1	63	28.5	-	7.7	-	-	-	-	-	18	138	182	-	180	-	-	-	-
7	8	63	29.0	-	7.7	-	-	-	-	-	17	120	170	-	1060	-	-	-	-
7	15	63	27.0	-	7.7	-	-	-	-	-	18	126	190	-	340	-	-	-	-
7	22	63	28.0	-	7.7	-	-	-	-	-	20	126	176	-	500	-	-	-	-
7	29	63	28.0	-	7.7	-	-	-	-	-	20	130	196	-	220	-	-	-	-
8	5	63	30.0	-	7.7	-	-	-	-	-	21	126	192	-	180	-	-	-	-
8	12	63	29.5	-	7.7	-	-	-	-	-	20	138	198	-	300	-	-	-	-
8	19	63	29.0	-	7.7	-	-	-	-	-	20	124	200	-	420	-	-	-	-
8	26	63	25.0	-	7.7	-	-	-	-	-	18	104	180	-	340	-	-	-	-
9	3	63	26.0	-	7.9	-	-	-	-	-	26	158	210	-	180	-	-	-	-
9	9	63	25.5	-	7.7	-	-	-	-	-	24	164	202	-	140	-	-	-	-
9	16	63	24.0	-	7.7	-	-	-	-	-	27	116	202	-	180	-	-	-	-
9	23	63	24.0	-	7.6	-	-	-	-	-	22	128	170	-	260	-	-	-	-
9	30	63	21.0	-	7.7	-	-	-	-	-	21	156	206	-	180	-	-	-	-

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Thebes, Illinois
Operated by U.S. Geological Survey

STATE: Missouri

MAJOR BASIN: Upper Mississippi River

MINOR BASIN: Mississippi-Capr Girardeau Area

STATION LOCATION: Mississippi River at Cape Girardeau, Missouri

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	149.000	102.000	90.000	71.000	50.000	70.000	242.000	131.000	232.000	140.000	114.000	76.000
2	142.000	101.000	89.000	68.000	52.000	69.000	249.000	135.000	214.000	138.000	108.000	81.000
3	135.000	103.000	89.000	66.000	54.000	65.000	256.000	146.000	191.000	129.000	101.000	79.000
4	130.000	106.000	87.000	69.000	55.000	67.000	253.000	172.000	165.000	116.000	101.000	80.000
5	134.000	108.000	84.000	69.000	58.000	78.000	248.000	191.000	144.000	104.000	101.000	82.000
6	136.000	107.000	83.000	67.000	60.000	125.000	240.000	188.000	135.000	94.000	99.000	79.000
7	135.000	101.000	83.000	66.000	61.000	216.000	227.000	179.000	130.000	90.000	100.000	78.000
8	133.000	97.000	84.000	66.000	57.000	294.000	211.000	185.000	131.000	93.000	105.000	77.000
9	136.000	99.000	80.000	65.000	57.000	310.000	200.000	184.000	130.000	105.000	105.000	78.000
10	133.000	96.000	76.000	68.000	58.000	296.000	192.000	176.000	137.000	102.000	106.000	78.000
11	129.000	93.000	76.000	70.000	60.000	278.000	183.000	167.000	133.000	95.000	112.000	78.000
12	133.000	93.000	74.000	69.000	65.000	255.000	176.000	161.000	140.000	96.000	114.000	79.000
13	141.000	95.000	71.000	67.000	68.000	235.000	172.000	159.000	151.000	97.000	115.000	81.000
14	143.000	96.000	59.000	62.000	85.000	220.000	164.000	159.000	148.000	94.000	112.000	79.000
15	141.000	93.000	56.000	57.000	95.000	214.000	156.000	158.000	155.000	99.000	104.000	74.000
16	140.000	93.000	59.000	59.000	82.000	242.000	149.000	153.000	149.000	101.000	92.000	74.000
17	142.000	95.000	64.000	59.000	73.000	298.000	146.000	164.000	139.000	101.000	84.000	71.000
18	155.000	99.000	66.000	58.000	68.000	292.000	142.000	226.000	136.000	114.000	83.000	72.000
19	155.000	99.000	67.000	56.000	66.000	273.000	140.000	274.000	136.000	122.000	87.000	77.000
20	148.000	98.000	66.000	56.000	67.000	251.000	138.000	305.000	135.000	117.000	92.000	77.000
21	142.000	98.000	65.000	52.000	66.000	246.000	134.000	290.000	138.000	113.000	98.000	71.000
22	135.000	98.000	65.000	46.000	64.000	261.000	129.000	267.000	139.000	121.000	95.000	69.000
23	138.000	103.000	66.000	44.000	65.000	277.000	129.000	243.000	133.000	132.000	91.000	70.000
24	140.000	105.000	66.000	42.000	66.000	280.000	129.000	225.000	131.000	132.000	89.000	73.000
25	133.000	99.000	69.000	42.000	72.000	276.000	127.000	207.000	130.000	118.000	87.000	77.000
26	125.000	96.000	69.000	43.000	76.000	265.000	124.000	195.000	129.000	110.000	83.000	78.000
27	128.000	93.000	67.000	40.000	75.000	244.000	126.000	192.000	126.000	111.000	82.000	77.000
28	123.000	91.000	64.000	40.000	72.000	230.000	126.000	203.000	120.000	107.000	87.000	76.000
29	117.000	93.000	68.000	42.000		223.000	120.000	224.000	116.000	111.000	87.000	72.000
30	110.000	93.000	76.000	45.000		223.000	122.000	244.000	120.000	114.000	84.000	70.000
31	104.000		77.000	47.000		233.000		245.000		116.000	78.000	

MISSISSIPPI RIVER AT EAST ST. LOUIS, ILLINOIS

The sampling point for this station is on the east bank of the Mississippi River at the intake of the East St. Louis Water Company which is located approximately 20 river miles above the filter plant.

There is a considerable amount of domestic and industrial water use of the Mississippi River water in this area. Most of the major cities and towns, including Alton, Grafton, and Quincy, Illinois discharge treated wastes into the river. There is a complex of chemical, steel, petroleum and meat packing industries located at Alton, Hartford, Monsanto, National City, Wood River and Roxana, Illinois that discharge wastes of unknown quantity and strength into the river.

Several of the cities above East St. Louis have recently received federal grants for the construction of sewage treatment plants and these plants are in various stages of construction.

Median concentrations of coliform bacteria reached the highest levels observed to date during the summer of 1963.

	MEDIAN COLIFORM LEVELS/100 ml.					
Water Year	1958	1959	1960	1961	1962	1963
Fall	6,300	8,000	6,000	9,000	9,000	4,100
Winter	4,300	5,100	3,200	5,500	2,600	4,200
Spring	4,300	5,100	3,500	5,300	2,500	6,200
Summer	8,600	14,000	11,000	4,100	5,000	20.000

Station Location: Mississippi River at East St. Louis, Illinois

Major Basin: Upper Mississippi River

Minor Basin: Mississippi River - St. Louis area

Station at: 38°39' Latitude 90°11' Longitude

Miles above mouth: 1166

Activation Date: December 24, 1957

Sampled by: East St. Louis Water Company

Field Analysis by: East St. Louis Water Company

Other Cooperating Agencies: Illinois State Department of Public Health

Hydrologic Data:

Nearest pertinent gaging station: At Alton, Illinois

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 171,500 square miles

Period of record: 1927 to present

Average discharge in record period: 93,910 cfs.

Maximum discharge in record period: 437,000 cfs.

Minimum discharge in record period: 7,960 cfs.

Remarks: Flows affected by operation of reservoirs and navigation dams in Upper Mississippi basin. During large floods on the Missouri River when levels are overtopped, these flows affect discharges at Alton. Of the 437,000 cfs maximum, 90,000 cfs were from the Missouri.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l
3- 4-63	0.22
3-11-63	0.15
3-25-63	0.09
4- 1-63	0.08
4- 8-63	0.08
4-15-63	0.10
4-22-63	0.11
4-29-63	0.09
5- 6-63	0.07
5-13-63	0.07
5-20-63	0.09
5-29-63	0.08
6- 3-63	0.06
6-10-63	0.07
6-18-63	0.07
6-24-63	0.09
7- 1-63	0.06
7- 8-63	0.09
7-15-63	0.08
7-22-63	0.09
7-30-63	0.13
8- 5-63	0.12
8-19-63	0.07
8-26-63	0.08
9- 3-63	0.09
9- 9-63	0.09
9-30-63	0.07

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.28	.35
	Na	15	12
	K	3.5	4.3
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	10	*3
	Cd	*2	*3
	As	*25	*26
	B	38	36
	P	18	*13
	Fe	55	23
	Mo	87	12
	Mn	1	*1.3
	Al	-	13
	Be	*.06	*.07
	Cu	3	*2
	Ag	*.5	*.7
	Ni	*1	*3
	Co	*5	*3
	Pb	12	*7
	Cr	*1	*7
	V	*2	*13
	Ba	59	37
	Sr	65	68

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	1.8	.3	April to June	4.0	.4
January to March	-	-	Juiy to September	-	-

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l
8/20 - 8/26/63	Endrin	*.001
8/20 - 8/26/63	Dieldrin	.003
9/17 - 9/23/63	Endrin	*.001
9/17 - 9/23/63	Dieldrin	.003

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.

See page 21.

RADIOACTIVITY DETERMINATIONS

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI RIVER-ST. LOUIS AREA

STATION LOCATION MISSISSIPPI RIVER AT EAST ST. LOUIS, ILLINOIS 24

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER														RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						DATE OF DETERMINATION		GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO	DAY	pc/g	±	pc/g	±
[illegible]	1	62	12	30	-	-	-	-	-	-	138	84	47	22	185	27						
[illegible]	8	62	11	1	0	1	0	1	0	1	7	6	26	8	33	10						
10	15	62	11	2	-	-	-	-	-	-	9	8	23	8	32	11						
10	22	62	11	9	-	-	-	-	-	-	3	6	16	8	19	10						
10	29	62	11	17	-	-	-	-	-	-	21	8	30	9	51	12						
11	26	62	12	12	0	1	1	1	1	1	9	8	37	9	46	11						
12	17	62	1	15	0	1	0	1	0	1	4	6	15	8	19	10						
1	28	63	2	21	0	2	2	2	2	2	5	6	21	10	26	12						
2	25	63	3	21	0	1	1	1	1	1	3	5	23	7	26	9						
3	20	63	4	17	0	2	0	2	0	2	211	44	69	20	280	45						
4	22	63	5	21	1	1	1	1	1	1	56	4	54	5	112	6						
5	17	63	6	19	0	2	1	2	1	2	134	33	68	10	202	34						
6	24	63	7	19	0	2	2	2	2	2	31	8	47	9	78	12						
7	22	63	8	18	0	6	2	2	2	2	81	30	44	9	125	31						
8	26	63	9	23	1	2	1	2	1	2	31	8	29	5	60	9						
9	30	63	10	29	0	1	2	2	2	2	8	8	34	10	42	12						

PLANKTON POPULATION

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI RIVER-ST. LOUIS AREA

STATION LOCATION MISSISSIPPI RIVER AT EAST ST. LOUIS, ILLINOIS 024

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA (Number per ml)	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH				PROTOZOA (Identifiable) (Number per ml)	ROTIFERS										CRUSTACEA								NEMATODES (Identifiable) (Number per liter)	OTHER ANIMAL FORMS (Number per liter)
														NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes)										NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes)									
															1ST		2ND		3RD		4TH		5TH			1ST		2ND		3RD					
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT				GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL			
10	1	62	80	17	26	14	82	12	56	10	48	-	-	-											-						-	-
10	15	62	26	24	80	19	56	16	82	12	29	-	-	21	11	2									0						0	0
11	5	62	82	25	26	17	56	16	80	10	26	-	-	33	11	4	2	1	22	1					5	77	1				0	0
11	19	62	56	35	82	25	80	15	9	12	13	40	-	49	11	3	17	1	2	1	21	1			2						0	0
12	3	62	80	69	56	11	9	11	82	3	6	-	-	596	2	6	17	5	11	5	21	5	19	2	40	77	4	50	3		0	0
12	17	62	82	51	80	37	56	4	9	2	4	-	-	441	21	7	17	4	11	3	2	3			1						0	0
1	7	63	80	92	82	4	56	1	71	1	2	-	-	177	21	5	15	3	2	2	17	2	11	1	9	50	2				0	0
1	21	63	80	53	82	39	9	4	92	1	3	-	-	99	21	3	2	3	17	3	11	1			6	50	2				1	0
2	4	63	82	86	9	10	80	2	26	1	1	80	-	3											1						0	0
2	18	63	82	81	9	10	80	2	26	2	5	-	-	0											0						0	0
3	4	63	80	44	82	34	9	9	66	2	11	-	-	1											1						0	0
3	18	63	80	22	71	17	92	11	56	11	37	-	-	0											0						0	0
4	1	63	80	29	56	19	71	11	83	7	34	-	-	0											0						0	0
4	15	63	80	48	82	30	56	14	71	3	5	-	-	302	2	5	21	4	11	3	17	3	7	2	60	50	5	76	3		1	0
5	6	63	80	50	56	16	82	16	9	4	14	-	-	-											-						-	-
5	20	63	82	64	80	10	26	4	9	4	18	-	-	7	11	1									0						0	0
6	3	63	80	65	83	22	26	5	56	5	3	-	-	-											-						-	-
6	24	63	82	49	80	19	26	11	56	4	17	-	-	2											0						0	0
7	1	63										-	-	-											-						-	-
7	15	63	27	49	26	30	80	6	56	4	9	-	-	960	2	7	17	6	11	3					21	53	3	51	2		0	0
8	5	63	56	76	58	8	26	7	82	3	6	-	-	?											15	51	2	53	2		0	0
8	19	63	56	51	58	17	29	11	80	11	10	-	-	0											0						0	0
9	3	63	58	43	80	9	56	8	26	6	34	-	-	12	17	2									0						0	0
9	16	63	18	26	56	20	58	18	80	17	19	-	-	57	15	3	22	1	17	1	46	1			0						0	0

PLANKTON POPULATION

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI RIVER To GULF AREA

STATION LOCATION MISSISSIPPI RIVER AT

EAST ST. LOUIS, ILLINOIS 24

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Unicellular)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE																			
10	1	62	1300	40	60	40	0	60	0	790	330	80	120	71	2	69	1	66	1												
10	15	62	3400	20	20	230	0	140	20	2520	440	1150	90	69	4	71	2	66	2	38	1										
11	5	62	2800	100	40	410	0	230	0	1280	700	660	0	71	3	66	2	69	1	88	1	38	1	51	1						
11	19	62	15500	250	410	1650	0	620	210	11030	1530	9810	0	71	6	69	4	51	2	42	2	87	2	38	2	91	2	25	2	68	1	3	1
12	3	62	11100	60	180	1490	0	800	90	7700	1080	8870	180	71	6	69	4	38	3	77	2	51	2	24	1	34	1						
12	17	62	22700	370	210	1410	0	37	40	18420	710	12470	0	71	7	24	3	25	2	3	2	51	1	77	1								
1	7	63	1310	0	270	90	0	180	0	12340	220	4960	160	71	7	77	1																
1	21	63	21600	0	170	40	0	0	0	20710	670	7440	0	71	8	77	2	92	1	17	1												
2	4	63	7600	130	210	360	0	0	250	6090	710	4750	290	71	6	77	1	65	1	26	1	17	1										
2	18	63	1900	0	0	20	0	180	150	1320	200	290	70	71	4	51	1	77	1														
3	4	63	7900	40	80	130	0	290	170	6760	420	630	210	71	6	77	2	51	1	65	1												
3	18	63	2100	0	20	0	0	200	130	1100	540	420	400	71	3	66	1																
4	1	63	2600	0	170	60	0	360	360	1510	140	1620	190	71	4	51	2	65	1	17	1												
4	15	63	18300	130	210	710	0	500	460	15620	630	2770	380	71	7	88	2	51	2	25	2	63	1	17	1								
5	6	63	3700	0	20	130	0	0	0	2970	580	810	420	71	5	88	1																
5	20	63	4900	0	40	400	0	130	0	3850	480	2290	510	71	5	38	1	66	1	69	1												
6	3	63	3900	40	0	240	0	130	0	2990	460	1230	110	71	5	69	2																
6	24	63	1300	0	50	200	0	50	0	590	110	180	50	71	2																		
7	1	63	*	-	-	-	-	-	-	-	-	-	-																				
7	15	63	2200	0	20	350	0	70	20	1470	310	1120	70	68	4																		
8	5	63	4800	20	20	640	0	90	30	3610	410	1060	110	69	4	68	3	38	2	71	1	92	1										
8	19	63	2500	0	0	300	0	90	0	1880	230	360	500	69	3	71	2	68	2														
9	3	63	1800	0	20	350	0	40	0	1120	260	510	40	71	2	68	2	69	2	38	1												
9	16	63	2300	0	0	660	0	70	0	1320	220	330	90	67	2	38	2	71	2	69	1	68	1										

* TOO TURBID TO COUNT

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI RIVER-ST. LOUIS AREA

STATION LOCATION MISSISSIPPI RIVER AT EAST ST. LOUIS, ILLINOIS 24

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	1	62	10	11	2010	312	124	188	1	32	34	3	2	28	1	16	14	3	24
11	5	62	11	14	3464	260	66	194	1	15	30	6	4	19	1	9	3	1	7
12	4	62	12	14	2071	421	60	361	1	10	33	4	4	25	0	7	2	1	6
1	7	63	1	18	4308	184	56	128	1	9	28	4	3	20	1	8	2	1	7
2	12	63	2	25	4172	284	73	211	2	15	31	3	4	21	3	10	5	2	8
3	13	63	3	21	2559	484	256	228	-	-	-	-	-	-	-	-	-	-	-
4	4	63	4	12	1767	393	146	247	4	41	41	5	5	29	2	16	12	3	29
5	1	63	5	8	1671	401	99	302	-	-	-	-	-	-	-	-	-	-	-
6	3	63	6	8	2707	316	132	184	8	31	39	3	3	30	3	24	20	2	8
7	1	63	7	18	566*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	20	63	8	26	2104	300	112	188	3	33	30	2	2	26	0	15	13	2	16
9	17	63	9	23	4519	131	28	103	-	-	-	-	-	-	-	-	-	-	-

* LOW FLOW

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI RIVER-ST. LOUIS AREA

STATION LOCATION MISSISSIPPI RIVER AT EAST ST. LOUIS, ILLINOIS 24

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	1	62	19.8	7.5	7.9	2.0	-	-	-	.1	16	148	192	20	1200	65	.3	288	-
10	2	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10000
10	8	62	19.8	7.7	8.0	2.1	-	-	-	.1	17	152	192	25	150	62	.4	292	-
10	15	62	21.0	7.4	7.7	2.2	-	-	-	.1	16	140	196	30	100	60	.4	295	1000
10	22	62	19.4	7.8	7.7	2.5	-	-	-	.1	16	148	212	25	200	74	.3	295	23000
10	28	62	15.0	8.6	7.8	2.6	-	-	-	.1	16	156	214	20	250	68	.3	300	-
10	29	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7300
11	5	62	11.5	9.4	8.0	5.7	-	-	-	.2	18	164	204	20	50	70	.4	286	3000
11	13	62	9.9	10.0	8.0	5.5	-	-	-	.2	18	164	220	25	75	71	.4	301	2500
11	19	62	9.9	10.2	8.1	3.1	-	-	-	.3	19	168	220	25	100	68	.4	310	4100
11	26	62	8.2	10.4	8.1	4.0	-	-	-	.3	18	170	224	21	100	69	.5	310	4100
12	3	62	7.1	10.8	8.2	5.1	-	-	-	.3	18	176	220	22	50	68	.4	310	4400
12	10	62	4.9	11.2	8.5	5.0	-	-	-	.3	18	184	232	26	30	64	.4	315	3100
12	17	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2500
1	7	63	1.6	14.0	8.4	5.6	-	-	-	.8	21	184	232	32	25	70	.4	326	1300
1	14	63	.5	14.6	8.2	6.6	-	-	-	.9	24	208	260	26	50	88	.4	324	1300
1	21	63	.5	14.5	8.2	6.5	-	-	-	1.0	19	199	240	27	50	80	.4	322	4800
1	28	63	.5	14.5	7.9	6.4	-	-	-	1.0	20	199	248	26	50	65	.4	326	2900
2	4	63	.5	14.3	7.8	6.7	-	-	-	1.0	22	196	256	27	50	61	.3	316	22000
2	11	63	.5	14.3	7.7	6.7	-	-	-	1.1	21	188	240	26	50	60	.4	316	3100
2	18	63	1.1	-	7.8	-	-	-	-	1.1	21	184	236	29	100	60	.4	334	6100
2	25	63	1.1	-	7.5	-	-	-	-	1.0	22	172	240	28	30	72	.4	-	4200
3	4	63	1.6	-	7.7	-	-	-	-	.9	24	168	224	25	50	70	.4	328	4100
3	11	63	2.7	-	7.6	-	-	-	-	1.1	20	88	136	36	800	48	.3	228	9400
3	18	63	4.1	-	7.6	-	-	-	-	1.2	14	116	156	40	400	58	.3	272	14000
3	25	63	6.0	-	7.7	-	-	-	-	1.1	18	124	172	40	600	55	.3	250	1000
4	1	63	10.4	-	7.6	-	-	-	-	1.0	18	136	188	31	250	60	.4	258	5000
4	8	63	13.2	-	7.8	-	-	-	-	.9	17	144	192	26	150	57	.3	266	2600
4	15	63	12.6	-	7.9	-	-	-	-	.4	17	146	192	30	125	56	.3	206	4200
4	22	63	16.1	9.2	8.5	6.8	-	-	-	.2	17	148	188	27	90	45	.3	292	4500
4	29	63	14.3	8.5	8.5	4.1	-	-	-	.2	20	148	200	26	100	59	.4	292	8000
5	6	63	16.1	-	7.7	-	-	-	-	.1	17	140	192	20	800	73	.3	-	12000
5	13	63	20.4	-	7.9	-	-	-	-	.1	19	152	232	21	250	67	.4	292	-
5	20	63	18.8	-	7.7	-	-	-	-	.1	15	132	180	25	600	57	.3	-	10000
5	27	63	17.7	8.9	7.7	6.2	-	-	-	.1	16	148	196	25	250	40	.3	-	5800
6	3	63	21.5	-	7.9	-	-	-	-	.1	18	148	192	29	100	62	.2	296	11000
6	10	63	27.3	-	8.0	-	-	-	-	.1	17	148	200	25	100	56	.4	292	2300
6	17	63	24.4	6.2	7.6	4.8	-	-	-	.1	17	148	204	23	100	56	.2	274	-

736-497 O - 64 - 5

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE ILLINOIS

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI RIVER-ST. LOUIS AREA

STATION LOCATION MISSISSIPPI RIVER AT EAST ST. LOUIS, ILLINOIS 24

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
A	18	A3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15000
6	24	63	24.4	-	7.8	-	-	-	-	.1	18	156	206	23	100	57	-	299	6600
7	1	63	27.7	5.4	7.7	4.6	-	-	-	.1	20	154	216	22	1200	64	.4	305	-
7	8	63	27.3	-	8.0	-	-	-	-	.1	17	152	196	27	300	60	.2	292	11000
7	15	63	28.2	5.9	7.8	4.0	-	-	-	.1	19	156	216	25	350	68	.4	310	27000
7	22	63	28.8	7.1	8.0	3.2	-	-	-	.1	18	148	188	26	100	66	.2	290	6000
7	29	63	28.9	6.4	8.0	3.4	-	-	-	.1	20	160	212	30	40	68	.2	316	24000
8	5	63	29.9	6.0	8.2	3.0	-	-	-	.1	20	148	204	30	75	66	.2	312	8000
8	12	63	29.8	6.8	8.2	3.1	-	-	-	.1	19	156	212	28	100	62	.3	301	3800
8	19	63	25.0	7.2	7.8	2.0	-	-	-	.1	19	148	220	20	250	67	.3	299	-
8	26	63	25.0	7.8	7.0	2.6	-	-	-	.2	16	136	180	27	150	72	.4	296	19000
9	3	63	25.0	8.0	7.9	2.0	-	-	-	.2	20	160	216	25	100	68	.5	314	5500
9	9	63	26.2	7.8	7.9	3.6	-	-	-	.1	19	168	225	25	90	80	.4	315	25000
9	16	63	23.2	8.5	7.9	4.0	-	-	-	.2	22	168	224	25	100	81	.5	322	32000
9	23	63	7.4	8.5	7.8	3.2	-	-	-	.2	23	160	216	23	100	90	.4	370	26000
9	30	63	21.0	8.8	8.0	3.6	-	-	-	.3	23	160	228	20	100	89	.4	372	20000

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Alton, Illinois
Operated by U.S. Geological Survey

STATE Illinois

MAJOR BASIN Upper Mississippi River

MINOR BASIN Mississippi River-St. Louis Area

STATION LOCATION Mississippi River at East St. Louis, Illinois

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	63.600	51.700	52.000	35.800	27.800	28.700	162.000	85.500	77.400	55.400	51.300	32.400
2	59.400	53.000	50.400	40.900	27.800	32.000	160.000	105.000	72.300	52.200	51.600	31.200
3	60.600	52.400	45.800	39.600	29.000	31.600	163.000	115.000	61.400	46.900	53.300	35.800
4	63.400	49.300	44.700	38.300	27.800	53.600	159.000	118.000	69.600	40.600	51.600	32.400
5	63.800	45.700	44.700	38.300	27.800	117.000	152.000	109.000	66.200	37.300	48.900	32.400
6	59.300	43.600	49.200	39.600	26.600	156.000	147.000	109.000	70.800	39.200	51.100	31.200
7	63.500	48.700	44.100	39.600	24.400	152.000	139.000	113.000	69.000	49.900	53.700	32.400
8	62.300	47.700	40.100	42.200	23.400	147.000	137.000	117.000	66.300	48.800	53.300	33.600
9	63.800	40.700	44.100	43.500	24.400	144.000	132.000	103.000	65.900	42.600	62.900	32.400
10	59.600	42.700	40.900	40.900	31.200	130.000	124.000	96.500	61.300	40.300	67.000	33.600
11	63.500	43.500	43.500	39.600	31.200	121.000	118.000	98.200	77.200	46.000	60.200	34.700
12	63.400	47.800	24.400	35.800	42.300	119.000	113.000	101.000	75.700	40.300	52.400	37.000
13	68.300	42.200	31.200	30.100	27.600	116.000	104.000	111.000	80.300	43.600	50.500	31.200
14	66.800	44.200	33.600	33.000	29.200	114.000	97.000	105.000	91.900	53.300	43.600	33.600
15	65.900	44.500	37.000	33.000	34.600	132.000	95.400	99.300	74.700	44.400	37.100	31.200
16	69.300	47.600	38.300	33.500	30.400	151.000	88.800	126.000	75.500	51.800	37.900	31.200
17	69.600	50.400	40.300	38.000	32.300	155.000	86.400	173.000	86.500	53.200	39.200	34.700
18	65.800	51.300	40.900	43.200	34.400	152.000	84.000	158.000	78.400	47.800	40.400	31.200
19	71.700	53.300	40.900	43.000	34.600	133.000	79.800	148.000	80.000	57.200	54.000	23.400
20	68.100	52.000	39.600	35.500	31.300	147.000	72.900	140.000	81.200	65.300	46.600	22.400
21	72.500	53.700	44.800	33.500	34.200	164.000	77.000	131.000	78.000	77.200	42.400	23.400
22	86.000	51.500	40.900	28.500	34.700	174.000	77.500	124.000	73.300	84.400	41.200	24.400
23	81.100	43.800	43.500	30.500	42.400	177.000	76.200	117.000	72.300	71.800	37.200	29.000
24	67.400	47.200	38.300	31.000	44.400	172.000	73.300	112.000	68.500	58.600	32.400	29.000
25	66.300	43.800	38.300	29.500	45.500	159.000	72.800	109.000	71.900	59.300	33.900	29.000
26	59.300	45.000	31.200	24.400	39.500	150.000	80.400	105.000	67.000	58.900	38.300	27.800
27	58.700	45.600	38.300	26.600	42.400	150.000	73.300	102.000	64.300	63.900	37.000	25.500
28	55.400	45.000	42.200	27.800	41.700	151.000	74.800	92.000	60.400	62.700	34.700	22.400
29	49.600	48.700	44.800	26.600		159.000	75.700	86.300	58.300	69.000	30.100	25.500
30	49.600	50.100	37.000	26.600		161.000	77.700	79.600	49.400	64.800	27.800	21.300
31	49.200		38.300	27.800		161.000		80.300		57.800	33.600	

MISSISSIPPI RIVER AT BURLINGTON, IOWA

The Water Pollution Surveillance System at Burlington, Iowa is about 35 miles above the Missouri State line. Samples are taken from the municipal water plant intake.

Davenport, Iowa, Rock Island, and Moline, Illinois all within 100 miles of the station, discharge a total BOD population equivalent of 120,000 to the stream. Remedial measures are being undertaken.

Approximately 50,000 Stephanodiscus per milliliter were in each of the two plankton samples from the Mississippi River station at Burlington during December.

A moderately high count of algae was recorded for the June 3 sample at Burlington. The count was 16,093 per milliliter made up of a variety of genera of blue-greens, greens, flagellates and diatoms. The water sample also contained a high rotifer count of 1,079 per liter.

Station Location: Mississippi River at Burlington, Iowa

Major Basin: Upper Mississippi River

Minor Basin: Mississippi-Des Moines-Skunk Rivers

Station at: 40°48' Latitude 91°04' Longitude

Miles above mouth: 1369

Activation Date: October 28, 1957

Sampled by: Burlington Water Department

Field Analysis by: Burlington Water Department

Other Cooperating Agencies: Iowa State Department of Health

Hydrologic Data:

Nearest pertinent gaging station: At Keokuk, Iowa

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 119,000 square miles

Period of record: 1878 to present

Average discharge in record period: 60,980 cfs.

Maximum discharge in record period: 314,000 cfs.

Minimum discharge in record period: 5,000 cfs.

Remarks: Flows affected by operation of power plants, reservoirs and navigation dams.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l
7-1-63	0.05
7-8-63	0.05
7-15-63	0.06
7-22-63	0.05
7-29-63	0.06
8-5-63	0.05
8-12-63	0.07
8-19-63	0.06
8-26-63	0.05
9-3-63	0.09
9-9-63	0.09
9-30-63	0.07

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.20	.20
	Na	9.0	7.4
	K	3.0	2.8
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	*5	7
	Cd	*2	*2
	As	*24	*19
	B	37	23
	P	*6	38
	Fe	116	12
	Mo	*2	24
	Mn	2.8	*1
	Al	–	*10
	Be	*.06	*.05
	Cu	26	19
	Ag	*.5	*.5
	Ni	*2	*2
	Co	*5	*2
	Pb	*6	*8
	Cr	*1	*5
	V	*2	*10
	Ba	43	31
	Sr	48	49

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	2.1	.3	April to June	–	–
January to March	–	–	July to September	7.3	.6

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l
8/5 - 8/13/63	Indrin	*.001
8/5 - 8/13/63	Dieldrin	.001
9/2 - 9/19/63	Indrin	*.001
9/2 - 9/19/63	Dieldrin	*.001

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-DES MOINES-SKUNK RIVERS

STATION LOCATION MISSISSIPPI RIVER AT BURLINGTON, IOWA

25

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON				
			DATE OF DETERMINATION		ALPHA					BETA					DATE OF DETERMINATION		GROSS ACTIVITY		
					SUSPENDED		DISSOLVED		TOTAL	SUSPENDED		DISSOLVED		TOTAL			ALPHA		BETA
MO	DAY	YR.	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO.	DAY	pc/g	±	pc/g	±
10	1	62	10	25	1	1	0	1	1	1	14	6	28	3	42	10						
10	8	62	11	7	–	–	–	–	–	–	13	6	22	7	35	9						
10	15	62	11	14	–	–	–	–	–	–	18	12	30	9	48	16						
10	22	62	12	5	–	–	–	–	–	–	15	7	23	8	38	11						
10	29	62	11	26	–	–	–	–	–	–	5	3	24	4	29	5						
11	26	62	12	19*	0	0	0	1	0	1	310	11	24	8	334	14						
12	17	62	1	23*	0	0	2	1	2	1	2	6	28	9	30	11						
1	28	63	2	21*	0	0	0	1	0	1	5	6	18	9	23	11						
2	25	63	3	11*	0	0	0	1	0	1	3	5	20	7	23	9						
3	25	63	4	16*	1	1	1	1	2	1	120	11	80	10	200	15						
4	29	63	5	20*	1	1	2	1	3	1	72	5	62	4	134	6						
5	27	63	6	17*	0	2	0	1	0	2	45	15	49	4	94	16						
6	18	63	7	30*	0	1	1	1	1	1	13	7	37	8	50	11						
7	29	63	8	16*	0	1	0	1	0	1	15	6	46	9	61	11						
8	26	63	9	20*	0	1	1	1	1	1	8	5	38	7	46	9						
9	30	63	10	22*	0	1	1	1	1	1	7	4	27	5	34	6						

PLANKTON POPULATION

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-DES MOINES-SKUNK RIVERS

STATION LOCATION MISSISSIPPI RIVER AT BURLINGTON, IOWA 025

| DATE OF SAMPLE | | | DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes) | | | | | | | | | FUNGI AND SHEATHED BACTERIA (Number per ml.) | MICROINVERTEBRATES | | | | | | | | |

PLANKTON POPULATION

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-DES MOINES-SKUNK RIVERS

STATION LOCATION MISSISSIPPI RIVER AT BURLINGTON, IOWA

25

DATE OF SAMPLE			ALGAE (Number per milliliter)								INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS			1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	9900	50	0	620	*	270	0	7230	360	1130	0	68	5	71	4	69	3	50	3	51	1	38	1								
10	15	62	8500	20	110	1740	0	250	0	5830	520	2780	230	68	4	69	4	71	4	27	3	38	2	26	2	24	1						
11	5	62	21200	990	290	1280	0	460	80	16970	1080	7290	210	71	7	68	3	69	3	3	2	92	2	24	2	87	1	38	1	25	1	1	1
11	19	62	9700	20	160	1040	0	50	20	7800	590	6890	180	71	6	69	3	24	2	77	2	84	1										
12	3	62	51500	210	120	2150	0	1450	170	45950	1450	12960	170	71	9	92	3	24	3	25	3	69	3	68	2	34	2	77	1	38	1	3	1
12	17	62	10900	0	50	140	0	90	0	10440	180	1530	50	71	7																		
1	7	63	8000	0	70	130	0	150	0	8270	310	860	40	71	6	77	1																
1	21	63	2500	0	0	90	0	0	0	2270	150	310	0	71	4																		
2	4	63	900	0	0	0	0	40	0	860	20	460	70	71	3																		
2	18	63	1600	0	0	20	0	0	80	1300	150	570	40	71	3																		
3	4	63	3100	0	90	0	0	40	40	2730	150	90	260	71	4	68	2																
3	18	63	3300	0	80	40	0	40	0	2330	530	1110	570	71	4	92	1	68	1														
4	1	63	3500	0	0	110	0	130	40	2730	510	1360	660	71	5	88	1																
4	15	63	37600	0	40	760	0	420	550	34940	880	4160	500	71	8	68	3	52	2	64	2	88	2	69	2	92	1	38	1	65	1		
5	6	63	26700	70	310	3260	0	420	0	20880	1740	7700	920	71	8	24	3	38	3	66	3	77	2	34	2	69	2	51	2	25	1	15	1
5	20	63	14600	20	660	2090	0	440	0	9860	1540	10120	680	71	6	69	3	38	3	17	2	92	2	25	2	77	2	16	2	51	2	88	1
6	3	63	16100	40	760	4350	0	570	250	9180	950	4050	290	71	6	24	3	68	3	26	3	38	3	69	3	51	2	17	2	77	2	15	2
6	17	63	2500	40	20	460	0	0	80	1660	210	2860	150	71	3	69	2	26	1	38	1												
7	1	63	6300	70	90	1520	0	260	110	3890	330	3260	110	71	5	38	2	26	2	66	2	35	1	51	1								
7	15	63	320	60	60	370	0	40	20	2260	390	830	0	69	3	68	3	71	2														
8	5	63	4900	170	20	290	0	60	20	4220	100	1370	270	69	5	71	2	68	2														
8	19	63	6300	210	20	1040	20	210	20	4490	290	1040	600	69	5	68	2	38	2	24	1												
9	3	63	610	20	90	970	0	90	0	4360	580	3180	280	69	5	71	3	68	2	24	2	38	1										
9	16	63	4600	50	50	610	0	270	20	3500	140	930	70	69	4	71	3	68	2	38	1	51	1										
10	1	62				*	1400																										

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-DES MOINES-SKUNK RIVERS

STATION LOCATION MISSISSIPPI RIVER AT BURLINGTON, IOWA

25

DATE OF SAMPLE BEGINNING			DATE OF SAMPLE END		GALLONS FILTERED	EXTRACTABLES			CHLOROFORM EXTRACTABLES										
											NEUTRALS								
MONTH	DAY	YEAR	MONTH	DAY		TOTAL	CHLORO-FORM	ALCOHOL	ETHER INSOLUBLES	WATER SOLUBLES	TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	1	62	10	9	4660	149	59	90	1	16	17	1	1	15	0	9	5	1	10
11	5	62	11	15	4180	165	46	119	1	13	15	1	1	12	1	5	2	1	9
12	3	62	12	12	4760	173	26	147	1	7	10	1	1	8	0	2	1	1	4
1	7	63	1	14	5010	170	25	145	–	–	–	–	–	–	–	–	–	–	–
2	4	63	2	11	4940	226	39	187	2	8	17	3	3	11	0	4	2	1	5
3	4	63	3	11	4133	295	97	198	–	–	–	–	–	–	–	–	–	–	–
4	1	63	4	8	3510	274	131	143	5	35	37	3	4	24	6	28	14	1	11
4	12	63	4	26	4060	232	66	166	2	17	23	1	2	17	3	7	3	2	12
5	6	63	5	12	3600	137	37	100	2	11	12	1	1	10	0	4	2	1	5
5	13	63	5	24	4580	135	49	86	–	–	–	–	–	–	–	–	–	–	–
5	27	63	6	4	5000	124	42	82	3	11	12	1	1	9	1	5	3	1	7
6	8	63	6	15	3430	187	85	102	–	–	–	–	–	–	–	–	–	–	–
6	18	63	6	28	4800	152	88	64	10	24	16	1	1	14	0	10	12	1	15
7	1	63	7	9	3260	241	104	137	–	–	–	–	–	–	–	–	–	–	–
8	5	63	8	13	1960	306	109	197	3	30	33	2	4	26	1	19	11	2	11
9	2	63	9	19	4180	131	39	92	–	–	–	–	–	–	–	–	–	–	–

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Keokuk, Iowa
Operated by U.S. Geological Survey

STATE Iowa

MAJOR BASIN Upper Mississippi River

MINOR BASIN Mississippi-Des Moines-Skunk Rivers

STATION LOCATION Mississippi River at Burlington, Iowa

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	48.000	39.500	34.000	30.200	23.200	28.400	117.000	61.200	53.900	41.300	35.400	24.700
2	47.800	39.200	34.200	30.300	23.200	27.400	120.000	66.800	50.900	39.800	39.200	24.300
3	47.500	38.400	36.300	30.000	22.500	29.000	116.000	67.500	49.700	34.300	41.100	22.900
4	44.900	36.500	36.600	30.400	23.300	40.100	114.000	65.200	52.800	26.300	40.800	22.400
5	45.500	36.500	36.600	31.200	23.100	52.400	107.000	70.800	54.200	26.100	37.600	24.500
6	47.200	36.000	35.800	31.900	23.600	57.300	110.000	69.700	54.300	28.500	37.000	24.600
7	50.100	36.000	35.300	32.500	24.000	60.900	106.000	64.500	54.000	27.800	40.300	25.300
8	49.800	35.000	34.400	30.600	26.800	65.600	103.000	64.600	48.900	27.000	42.200	25.700
9	50.100	36.000	34.600	30.000	26.900	66.000	98.000	62.600	47.200	28.200	43.800	25.200
10	51.800	35.100	30.100	29.500	29.300	62.900	94.000	61.800	51.800	28.900	42.000	24.400
11	54.400	36.000	21.900	28.900	28.700	63.300	90.600	64.400	56.500	23.500	37.600	24.200
12	55.900	36.400	20.700	27.600	27.400	61.700	86.200	66.500	60.100	21.800	34.500	23.600
13	54.300	36.100	22.200	27.900	26.700	63.800	85.800	66.300	59.100	21.300	33.500	25.000
14	57.700	35.500	26.300	27.600	27.500	70.100	80.500	64.200	59.700	26.200	29.000	24.600
15	60.100	36.700	28.200	29.400	27.400	86.100	74.600	71.900	60.700	28.800	27.500	23.800
16	58.700	40.800	30.800	28.000	25.100	96.500	71.500	80.900	62.200	31.600	27.800	24.900
17	59.000	42.000	30.000	27.800	24.500	89.800	68.900	85.700	62.800	32.900	27.500	23.400
18	58.000	40.500	28.700	26.800	27.300	84.700	65.800	90.700	60.800	34.800	28.500	19.200
19	55.300	39.500	27.900	27.300	27.300	95.500	62.800	92.000	60.500	40.000	31.500	18.100
20	65.800	37.100	31.000	24.500	29.100	114.000	61.200	95.700	60.900	59.000	30.900	19.600
21	61.000	35.600	31.800	25.300	30.800	122.000	61.200	95.000	60.800	71.400	30.200	21.900
22	52.400	36.100	31.800	24.600	32.600	129.000	60.900	92.500	60.300	55.700	28.500	25.500
23	49.500	33.000	29.700	24.300	31.800	118.000	62.200	89.900	59.600	46.200	24.300	26.100
24	49.000	33.200	24.500	24.300	30.500	108.000	61.600	87.000	57.000	38.800	23.700	26.900
25	48.300	35.900	29.500	24.200	31.000	108.000	59.400	87.000	55.600	37.300	33.000	25.400
26	46.400	36.500	29.600	24.100	27.900	113.000	53.900	80.500	54.400	40.300	30.300	21.900
27	40.500	34.800	30.200	24.000	27.300	118.000	52.800	73.500	52.700	46.600	26.600	20.700
28	37.000	35.100	30.300	24.600	27.900	121.000	49.900	68.600	47.800	47.400	24.000	20.600
29	38.500	34.500	31.700	23.200		120.000	51.800	66.600	42.800	46.000	24.000	22.000
30	38.600	34.500	30.800	23.100		119.000	58.900	66.400	40.600	43.000	24.900	24.900
31	37.900		30.500	23.600		119.000		61.400		38.000	24.800	

MISSISSIPPI RIVER AT DUBUQUE, IOWA

This station is located on the west side of the Mississippi River near the Iowa-Illinois-Wisconsin borders. Samples are collected at the Corps of Engineers Lock and Dam #11.

There are no known sources of significant municipal or industrial pollution in the vicinity. There is a considerable amount of barge traffic on the river. The city of Dubuque uses Mississippi River water only as an emergency source of supply.

Station Location: Mississippi River at Dubuque, Iowa

Major Basin: Upper Mississippi River

Minor Basin: Mississippi-Wapsipinicon and Trib.

Station at: 42°31' Latitude 90°39' Longitude

Miles above mouth: 1549

Activation Date: December 2, 1957

Sampled by: Dubuque Water Department

Field Analysis by: Dubuque Water Department

Other Cooperating Agencies: Iowa State Department of Health

Hydrologic Data:

Nearest pertinent gaging station: At McGregor, Iowa

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 67,500 square miles

Period of record: 193 to present

Average discharge in record period: 31,780 cfs.

Maximum discharge in record period: 197,500 cfs.

Minimum discharge in record period: 6,200 cfs.

Remarks: Flows affected by operation of navigation dams and reservoirs

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l
7-1-63	0.05
7-8-63	0.05
7-15-63	0.06
7-22-63	0.05
7-30-63	0.05
9-3-63	0.08
9-10-63	0.07
9-23-63	0.07
9-26-63	0.07
9-30-63	0.12

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.15	.20
	Na	7.0	6.0
	K	2.9	3.1
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	*5	9
	Cd	*2	*2
	As	*22	*17
	B	40	23
	P	*6	*9
	Fe	58	14
	Mo	*5	21
	Mn	*1.1	*.9
	Al	–	9
	Be	*.06	*.05
	Cu	10	11
	Ag	*.5	*.5
	Ni	*2	*2
	Co	*5	*2
	Pb	*6	*5
	Cr	*1	*5
	V	*2	*9
	Ba	38	27
	Sr	49	41

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	2.6	.3	April to June	4.2	.4
January to March	–	–	July to September	–	–

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l
8/10 - 8/15/63	Indrin	*.001
8/10 - 8/15/63	Dieldrin	.067
9/4 - 9/17/63	Indrin	*.001
9/4 - 9/17/63	Dieldrin	*.001

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-WAPSIPINICON & TRIB.

STATION LOCATION MISSISSIPPI RIVER AT DUBUQUE, IOWA

26

DATE SAMPLE TAKEN			DATE OF DETERMINATION		RADIOACTIVITY IN WATER												DATE OF DETERMINATION		RADIOACTIVITY IN PLANKTON			
					ALPHA						BETA								GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO	DAY	pc/g	±	pc/g	±
10	8	62	11	1	-	-	-	-	-	-	14	6	32	8	46	10						
10	15	62	11	16	1	1	3	3	4	3	15	5	8	9	23	10						
10	22	62	11	17	-	-	-	-	-	-	1	6	9	8	10	10						
11	26	62	12	12*	0	4	0	1	0	4	27	6	29	8	56	10						
12	31	62	2	5*	0	4	0	1	0	4	2	6	20	8	22	10						
1	29	63	3	21*	0	4	0	1	0	4	3	6	19	9	22	11						
2	18	63	3	28*	1	4	0	1	1	4	4	5	15	7	20	9						
3	19	63	4	22*	1	4	0	1	1	4	410	12	188	5	598	13						
4	29	63	5	17*	1	4	0	1	1	4	50	8	59	6	109	12						
5	27	63	6	13*	1	4	0	1	1	4	30	7	51	9	81	11						
6	24	63	7	15*	0	4	1	1	1	4	11	3	46	5	57	6						
7	22	63	8	19*	0	4	1	1	1	4	0	16	46	9	46	18						
8	26	63	10	10*	0	4	1	1	1	4	0	16	40	9	40	20						
9	30	63	12	22*	0	4	1	2	1	2	4	4	35	6	39	7						

PLANKTON POPULATION

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-WAPSIPINICON & TRIB.

STATION LOCATION MISSISSIPPI RIVER AT DUBUQUE, IOWA 026

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA (Number per ml)	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH				PROTOZOA (Identifiable) (Number per ml)	ROTIFERS										CRUSTACEA								NEMATODES (Identifiable) (Number per liter)	OTHER ANIMAL FORMS (Number per liter)
														GENERA AND COUNT LEVEL (See text for Codes)										GENERA AND COUNT LEVEL (See list 1 for Codes)									
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT			NUMBER PER LITER	1ST		2ND		3RD		4TH		5TH		NUMBER PER LITER	1ST		2ND		3RD			
															GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		
10	8	62	56	23	56	14	57	10	26	9	44	-	-	64	11	4	22	1							3	76	1					0	0
10	15	62	56	29	83	22	82	20	58	9	20	-	-	47	17	3	11	2	2	1					0							0	0
11	5	62	97	38	56	36	83	9	82	9	8	-	-	96	11	4	17	3	21	2	2	1			6	50	1	52	1			0	0
11	20	62	82	45	80	35	56	10	83	4	6	-	-	9	11	1									1							0	0
12	3	62	8[illegible]	89	9	4	57	2	56	1	4	-	-	12	11	2									0							0	0
12	29	62	8[illegible]	95	9	2	26	1	56	1	1	-	-	216	11	5	21	4	2	2	17	1			15	50	3					0	0
1	8	63	82	71	80	17	9	7	92	2	3	-	-	2											0							0	0
1	29	63	82	84	9	6	27	2	80	1	7	-	-	1											0							0	0
2	11	63	82	79	80	6	9	2	56	2	11	130	-	0											0							0	0
2	18	63	82	78	80	6	56	4	71	3	9	-	-	2											0							0	0
3	19	63	65	22	71	19	80	8	60	8	43	-	-	0											0							0	0
4	1	63	82	29	80	29	71	9	56	9	24	-	-	2											1							0	0
4	8	63	8[illegible]	38	82	38	56	8	71	4	12	-	-	6											0							0	0
4	15	63	82	89	56	4	9	3	26	1	3	-	-	2											0							0	0
5	6	63	82	52	80	32	56	6	9	4	6	-	-	718	11	7	2	4	17	3	21	2	7	2	39	76	4	52	1			1	0
5	20	63	58	37	82	31	80	11	35	5	16	-	-	509	11	7	17	3	2	3	21	2	7	1	96	50	5	76	4	52	3	0	0
6	3	63	56	29	82	24	80	16	46	9	22	-	-	352	11	6	17	5	21	2	2	1	6	1	69	52	4	51	4	76	3	0	0
6	17	63	82	45	58	12	47	10	56	8	25	-	-	702	22	6	11	6	17	5	21	5	2	3	114	50	5	76	4	52	1	0	0
7	1	63	82	47	56	24	58	16	26	3	10	-	-	14	11	2									2							0	0
7	15	63										-	-	195	18	4	22	4	17	4	11	2			12	50	3					0	0
7	30	63	56	77	58	15	82	6			1	-	-	113	22	4	18	3	11	3	17	1			59	50	5	76	2			0	0
8	19	63	56	42	28	31	26	12	57	3	12	-	-	1590	22	8	11	6	17	6	18	5	2	5	121	50	5					0	0
9	3	63	58	35	82	21	56	14	26	11	19	-	-	77	11	4	2	2	17	2					12	50	2	76	2			0	0
9	16	63	56	29	82	26	56	13	26	8	24	-	-	588	11	6	17	5	22	5	2	4	18	3	12	50	2						

PLANKTON POPULATION

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-WAPSIPINICON & TRIB.

STATION LOCATION MISSISSIPPI RIVER AT DUBUQUE, IOWA 26

DATE OF SAMPLE			ALGAE (Number per milliliter)								INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS			1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	8	62	4900	0	100	460	170	150	0	2630	1450	660	210	69	4	68	3	87	3	71	3	84	2	38	1	50	1				
10	15	62	3900	50	40	210	0	310	100	2730	460	370	170	71	4	69	4	51	1												
11	5	62	16600	50	410	970	0	110	0	14360	720	3800	110	71	7	69	5	24	2	15	2	77	1	82	1						
11	20	62	13400	0	140	600	0	180	0	12060	540	1670	140	71	7	69	2	24	2	77	2										
12	3	62	15400	210	40	210	0	250	0	13750	990	2190	0	71	7	69	2	77	1	51	1	3	1								
12	29	62	1600	0	0	20	0	20	0	1430	90	130	0	71	4																
1	8	63	4700	0	0	160	0	320	0	4050	200	450	0	71	6	57	1														
1	29	63	1200	0	0	0	0	0	70	1080	70	290	20	71	3																
2	11	63	2700	0	60	40	0	150	80	2290	80	690	40	71	4	68	2														
2	18	63	1200	0	20	20	0	0	60	1110	20	270	130	71	3																
3	19	63	1200	0	80	0	0	20	20	500	550	250	840	71	2	87	1	88	1												
4	1	63	2000	0	0	20	0	110	0	1650	200	330	220	71	4																
4	8	63	8100	0	0	240	0	90	70	7500	240	680	130	71	6	69	1	44	1												
4	15	63	56000	0	170	500	0	500	0	53590	1220	2440	710	71	9	68	3	88	2	92	2	52	1	69	1	25	1	26	1	51	1
5	6	63	32200	0	1110	3050	0	590	460	24650	2310	6150	440	71	8	17	3	82	3	21	3	69	3	68	3	88	3	26	3	77	3
5	20	63	17400	20	740	2980	0	270	320	11820	1260	3340	440	69	4	26	3	24	3	32	3	71	2	77	2	38	2	68	2	88	2
6	3	63	5400	110	400	770	0	200	0	3210	730	1430	220	71	4	69	2	92	2	38	1	68	1	15	1	51	1	77	1		
6	17	63	6900	110	90	1280	0	950	0	4110	400	1830	180	71	5	51	3	69	3	68	2	26	1	24	1	30	1	34	1	65	1
7	1	63	1200	90	0	120	0	140	0	720	150	380	160	69	2	71	2														
7	15	63	900	20	60	290	0	20	0	460	20	100	40	69	1																
7	30	63	2400	40	120	330	0	40	0	1260	600	1060	210	69	3																
8	19	63	3600	630	150	1470	0	20	0	1120	190	500	190	68	3	3	2	31	2	36	2	71	1	30	1						
9	3	63	2200	40	130	540	0	110	0	1250	130	1290	370	71	2	69	2	68	2	38	1										
9	16	63	3200	70	430	590	0	290	70	1520	200	410	90	71	3	69	2	68	2	11	2	51	1								

736-407 O - 64 - 6

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-WAPSIPINICON & TRIB.

STATION LOCATION MISSISSIPPI RIVER AT DUBUQUE, IOWA

26

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	ETHER INSOLUBLES	WATER SOLUBLES	CHLOROFORM EXTRACTABLES NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	1	62	10	10	1598	267	109	158	3	35	22	1	1	18	2	11	10	2	26
10	29	62	11	6	2445	-	*	155	-	-	-	-	-	-	-	-	-	-	-
12	4	62	12	13	5865	213	108	105	2	28	29	2	3	24	0	21	10	1	17
1	8	63	1	16	6000	152	35	117	1	9	11	1	1	9	0	4	3	1	6
2	3	63	2	18	8767	129	44	85	-	-	-	-	-	-	-	-	-	-	-
3	12	63	3	19	4432	297	76	221	2	17	34	3	4	25	2	11	4	2	6
4	3	63	4	12	2902	268	103	165	-	-	-	-	-	-	-	-	-	-	-
4	12	63	4	19	4635	155	51	104	1	12	20	1	2	15	2	5	2	2	9
4	23	63	5	1	4365	165	53	112	1	15	18	1	2	14	1	6	3	2	8
5	6	63	5	13	3330	162	67	95	5	15	23	1	1	21	0	11	5	1	7
5	15	63	5	22	1800	315	143	172	-	-	-	-	-	-	-	-	-	-	-
5	28	63	6	4	4800	153	59	94	2	16	17	1	1	14	1	10	5	1	8
6	4	63	6	11	4732	174	78	96	-	-	-	-	-	-	-	-	-	-	-
6	25	63	7	2	5468	120	43	77	1	11	13	1	1	11	0	7	4	1	6
7	4	63	7	14	4927	162	77	85	4	22	16	1	1	13	1	9	8	2	16
8	10	63	8	15	3667	181	45	136	-	-	-	-	-	-	-	-	-	-	-
9	4	63	9	17	2602	220	73	147	2	20	24	2	3	19	0	10	6	2	9

* LABORATORY ACCIDENT

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE IOWA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN MISSISSIPPI-WAPSIPINICON & TRIB.

STATION LOCATION MISSISSIPPI RIVER AT DUBUQUE, IOWA

26

DATE OF SAMPLE			TEMP (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	8	62	13.1	6.0	8.3	7.0	6	-	-	-	9	132	160	-	100	-	-	-	9000
10	16	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1500
10	23	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6000
11	5	62	5.0	11.5	8.6	2.0	4	-	-	-	8	115	164	-	100	-	-	-	440
11	20	62	4.8	13.7	8.5	2.0	4	-	-	-	-	137	162	-	100	-	-	-	100
11	26	62	5.7	12.4	8.2	2.1	3	-	-	-	9	145	173	-	100	-	-	-	400
12	3	62	4.0	12.3	8.4	1.8	3	-	-	-	8	150	172	-	*100	-	-	-	1000
2	5	63	.5	11.2	8.1	2.6	45	-	-	-	8	160	158	-	*25	-	-	-	-
2	12	63	.3	11.0	8.0	2.6	44	-	-	-	9	162	166	-	*25	-	-	-	-
2	18	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*10
2	19	63	1.0	13.5	7.8	5.5	72	-	-	-	9	112	118	-	250	-	-	-	-
2	26	63	7.5	7.0	7.8	5.3	70	-	-	-	9	110	135	-	75	-	-	-	-
4	1	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5000
4	8	63	9.8	8.7	8.2	5.8	10	-	-	-	8	127	136	-	25	-	-	-	370
4	15	63	9.7	7.3	8.9	6.0	11	-	-	-	9	113	121	-	60	-	-	-	1800
4	22	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1100
5	6	63	20.4	7.0	8.4	3.0	20	-	-	-	8	124	128	-	75	-	-	-	50
5	13	63	22.0	6.8	8.6	3.1	76	-	-	-	9	122	125	-	110	-	-	-	-
5	20	63	23.5	6.4	8.6	2.9	70	-	-	-	8	94	126	-	100	-	-	-	-
5	27	63	19.0	8.3	8.8	3.5	8	-	-	-	8	108	129	-	75	-	-	-	700
6	3	63	20.8	8.0	8.1	4.6	9	-	-	-	7	106	138	-	75	-	-	-	100
6	10	63	21.0	7.9	8.2	4.7	8	-	-	-	8	128	135	-	80	-	-	-	1400
6	17	63	21.0	8.4	8.3	4.9	8	-	-	-	9	130	142	-	75	-	-	-	20
6	24	63	23.3	8.4	8.1	4.8	7	-	-	-	9	129	138	-	-	-	-	-	300
7	1	63	23.0	8.0	8.3	5.1	8	-	-	-	9	132	135	-	50	-	-	-	550
7	8	63	23.6	8.0	8.6	9.0	30	-	-	-	4	124	158	-	-	30	.5	182	*10
7	16	63	23.0	8.0	8.1	9.4	27	-	-	-	5	130	155	50	*50	32	.4	185	800
7	22	63	23.2	8.1	8.2	9.1	26	-	-	-	7	128	157	-	-	34	.3	188	460
7	30	63	23.1	8.0	8.3	8.9	23	-	-	-	8	132	170	-	-	28	.2	180	5000
8	19	63	22.8	8.1	8.6	9.0	17	-	-	-	9	140	168	-	-	26	.1	170	1000
8	26	63	21.1	8.3	8.4	9.4	17	-	-	-	8	140	165	-	-	28	.1	166	-
9	2	63	20.7	8.5	8.5	9.2	19	-	-	-	9	142	162	-	-	26	.2	172	-
9	9	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30
9	9	63	13.5	8.0	8.2	8.8	17	-	-	-	8	134	158	-	*25	24	.3	178	-
9	10	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70
9	16	63	15.0	8.3	8.3	7.4	14	-	-	-	7	138	154	-	80	28	.4	190	630
9	23	63	16.8	7.1	8.4	2.2	12	-	-	-	7	140	156	-	70	24	.5	180	260
9	30	63	16.1	7.5	8.2	2.2	10	-	-	-	9	134	178	-	-	28	.4	174	30

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at McGregor, Iowa
Operated by U.S. Geological Survey

STATE: Iowa

MAJOR BASIN: Upper Mississippi River

MINOR BASIN: Mississippi-Wapsipinicon & Trib.

STATION LOCATION: Mississippi River at Dubuque, Iowa

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	22.400	20.800	21.000	15.000	12.000	13.000	72.000	28.300	37.500	23.800	29.300	14.300
2	23.900	20.300	21.000	15.000	12.000	13.000	71.200	28.000	35.300	17.000	25.100	15.200
3	27.300	21.000	20.000	14.500	12.000	13.000	70.400	34.000	33.800	14.600	24.300	15.300
4	30.100	20.800	19.000	14.500	12.000	13.000	67.900	34.900	34.900	14.800	25.500	15.500
5	31.200	19.800	19.000	14.500	12.500	14.000	65.700	35.200	35.100	13.900	27.800	16.600
6	28.400	20.100	19.000	14.500	12.500	15.000	64.300	37.500	35.000	15.000	26.500	18.100
7	25.800	19.400	19.000	15.000	13.000	15.500	59.300	35.400	35.100	16.700	25.400	19.100
8	26.500	18.900	20.000	15.000	13.000	16.000	58.800	33.500	37.500	15.400	24.900	19.100
9	31.300	20.500	19.500	15.500	13.000	16.000	57.700	33.700	40.600	13.700	24.500	15.200
10	34.700	21.800	18.000	15.500	13.000	15.000	54.700	36.600	40.100	12.900	24.500	13.200
11	34.000	22.700	17.000	15.000	13.000	14.500	52.600	37.500	40.100	13.000	22.900	14.400
12	32.200	21.500	15.500	14.000	12.800	14.000	49.100	37.700	40.300	13.200	20.200	15.100
13	31.700	20.400	14.000	13.500	12.800	14.000	46.100	42.900	40.700	16.800	19.900	15.200
14	34.400	20.100	12.500	13.500	12.800	15.000	46.100	46.300	41.100	20.800	19.600	13.300
15	35.300	20.500	13.000	13.500	12.500	17.000	43.100	50.100	41.900	19.800	20.400	15.200
16	31.800	20.200	13.500	13.000	12.500	19.000	37.200	54.000	41.700	17.900	21.800	12.100
17	28.400	20.900	14.000	13.000	12.500	26.000	35.200	56.800	42.900	16.400	21.800	11.100
18	26.100	20.900	14.000	12.500	13.300	26.000	33.100	57.200	43.900	14.600	22.100	13.900
19	26.100	21.200	14.500	12.500	13.300	30.500	34.000	59.100	44.600	16.200	21.600	15.500
20	27.200	21.700	15.000	12.500	13.300	41.000	36.100	60.500	45.000	19.300	19.800	19.200
21	25.600	19.700	15.000	12.500	13.300	41.000	38.200	58.600	45.700	18.300	18.300	20.400
22	22.700	19.500	15.500	12.500	13.300	41.000	31.400	54.700	45.500	15.500	17.000	20.200
23	22.700	19.000	15.500	12.500	13.300	45.000	30.100	49.200	43.900	18.700	17.400	17.400
24	20.500	17.800	15.500	12.500	13.300	50.000	30.000	44.900	41.500	24.200	17.600	13.900
25	17.500	18.900	15.000	12.500	13.300	58.000	29.400	43.500	38.400	27.000	17.600	13.200
26	17.700	18.800	14.500	12.500	13.300	60.000	29.500	43.000	36.600	25.700	16.600	14.200
27	17.900	18.900	14.500	12.500	13.300	62.000	32.300	41.400	34.100	25.700	13.600	16.700
28	21.200	20.000	15.000	12.000	13.000	64.000	32.200	39.700	32.100	25.500	17.100	16.400
29	22.900	21.100	15.500	12.000		67.700	34.200	36.800	28.300	23.400	17.400	14.800
30	22.400	21.600	15.500	12.000		69.600	34.700	31.200	25.600	23.600	15.000	14.800
31	21.600		15.000	12.000		71.800		33.600		31.500	15.000	

MISSISSIPPI RIVER LOCK AND DAM #3 BELOW ST. PAUL, MINNESOTA

This station is located on the Minnesota-Wisconsin border approximately 40 miles downstream from the Minneapolis-St. Paul area.

The Minneapolis-St. Paul area discharges treated wastes from a sewered population of 1,041,700 into the Mississippi River above this station. There are no reported sources of industrial pollution in the immediate vicinity. Agricultural activity in the watershed consists mainly of dairying and general farming operations.

The October 1962 count of total algae increased markedly over counts of previous samples. During December 1962, the centric diatom, Stephanodiscus hantzschii represented over 80% of the total count of 12,915 per ml. In April 1963, shortly after water temperatures rose above freezing an extremely large population of protozoa appeared in the samples. These phenomena are usually associated with an availability of large quantities of nutrient materials in the water.

During the 1963 water year there was a continued increase in coliform populations. Seasonal median coliform densities were:

Water Year	1956	1959	1960	1961	1962	1963
Autumn	17,000	6,900	34,000	33,000	14,000	55,000
Winter	1,800	10,000	1,600	13,000	21,000	20,000
Spring	4,800	10,000	45,000	3,800	23,000	100,000
Summer	1,800	2,000	1,700	650	30,000	7,500

The identification of endrin and dieldrin in the August and September 1963 samples extended the geographic range of these pesticides to throughout the Mississippi River.

Station Location: Mississippi River Lock and Dam #3 Below St. Paul, Minnesota

Major Basin: Upper Mississippi River

Minor Basin: Upper Portion - Upper Mississippi

Station at: 44°36' Latitude 92°36' Longitude

Miles above mouth: 1757

Activation Date: October 30, 1957

Sampled by: U.S. Army Corps of Engineers
Minneapolis-St. Paul Sanitary District

Field Analysis by: Minneapolis-St. Paul Sanitary District

Other Cooperating Agencies: Minnesota State Board of Health

Hydrologic Data:

Nearest pertinent gaging station: At Prescott, Wisconsin

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 44,800 square miles

Period of record: 1928 to present

Average discharge in record period: 14,790 cfs.

Maximum discharge in record period: 155,000 cfs.

Minimum discharge in record period: 1,380 cfs.

Remarks: Low and medium flows affected by operation of reservoirs, power plants, and navigation dams. High flows not significantly affected by storage.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l
7-2-63	0.09
7-8-63	0.07
7-16-63	0.10
7-23-63	0.14
7-29-63	0.09
8-6-63	0.08
8-13-63	0.08
8-20-63	0.07
8-27-63	0.05
9-4-63	0.10
9-10-63	0.15
9-24-63	0.11

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.12	.30
	Na	12	8.5
	K	3.2	3.8
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	23	5
	Cd	*2	*2
	As	*24	*21
	B	40	41
	P	122	41
	Fe	363	11
	Mo	53	31
	Mn	1	*1
	Al	—	10
	Be	*.06	*.05
	Cu	6	9
	Ag	*.5	*.5
	Ni	*1	*2
	Co	*5	*2
	Pb	12	*8
	Cr	*1	*5
	V	*2	*10
	Ba	51	36
	Sr	59	82

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	3.4	.4	April to June	—	—
January to March	—	—	July to September	7.2	.5

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l
8/6 - 8/13/63	Indrin	- 0.001
8/6 - 8/13/63	Dieldrin	- 0.001
9/3 - 9/10/63	Endrin	- 0.001
9/3 - 9/10/63	Dieldrin	- 0.001

Results represent specific identification in amounts too small to quantitate.

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN UPPER PORTION-UPPER MISSISSIPPI

STATION LOCATION MISSISSIPPI RIVER LOCK DAM #3 BELOW ST. PAUL, MINNESOTA

27

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL		ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO	DAY	pc/g	±	pc/g	±
10	2	62	10	25							10	6	25	9	35	10						
10	9	62	11	8							12	6	2	8	14	10						
10	16	62	12	24							9	4	35	7	44	8						
10	23	62	11	19							9	6	31	9	40	10						
10	30	62	11	26							7	3	18	4	25	5						
11	27	62	12	21*							9	6	31	9	40	11						
12	18	62	1	21*							2	3	16	6	18	4						
1	20	63	2	17*							2	6	23	8	25	10						
2	26	63	3	11*							0	4	13	7	13	8						
3	25	63	4	17*							15	6	38	8	53	11						
4	30	63	5	22*							34	7	68	9	102	11						
5	21	63	6	21*							31	5	69	7	100	9						
6	25	63	7	19*							19	3	92	6	111	7						
7	30	63	8	16*							10	7	63	10	73	12						
8	27	63	9	23*							7	3	58	5	65	6						
9	24	63	10	22*							8	4	43	6	51	7						

PLANKTON POPULATION

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN UPPER PORTION—UPPER MISSISSIPPI

STATION LOCATION MISSISSIPPI RIVER LOCK DAM #3 BELOW ST. PAUL, MINNESOTA 027

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA (Number per ml.)	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH		OTHER SPECIES PERCENT		PROTOZOA (Identifiable) (Number per ml.)	ROTIFERS										CRUSTACEA								HEMATODES (Identifiable) (Number per liter	OTHER ANIMAL FORMS (Number per liter)
															GENERA AND COUNT LEVEL (See text for Codes)										GENERA AND COUNT LEVEL (See text for Codes)									
														NUMBER PER LITER	1ST		2ND		3RD		4TH		5TH		NUMBER PER LITER	1ST		2ND		3RD			
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT					GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL			
10	2	62	58	34	56	28	83	13	82	10	15	–	–	534	11	6	2	5	21	5	17	4	22	2	3	50	1					0	0
10	16	62	82	29	56	17	58	16	26	16	22	–	–	496	2	6	11	6	21	4	17	3	20	2	3	51	1					0	0
11	6	62	80	47	56	11	83	10	71	2	30	–	–	134	21	4	11	3	17	3	22	1			3	50	1					1	0
11	20	62	83	60	82	22	9	6	26	5	7	50	–	35	11	2	21	2							3							0	0
12	4	62	56	25	80	20	82	16	83	7	32	–	–	144	21	4	11	4	17	3	2	1	15	1	3	50	1					0	0
12	18	62	82	91	80	2	91	2	9	2	3	790	–	81	11	3	21	3	2	1	17	1			9	50	2	76	1			0	0
1	2	63	82	92	9	3	91	1	16	1	3	–	–	2											0							0	0
1	16	63	82	87	27	7	9	3	89	1	2	–	–	0											1							0	0
2	5	63	82	71	9	7	80	3	91	2	17	–	–	1											0							0	0
2	18	63	82	78	9	5	51	3	57	3	11	–	–	0											1							0	0
3	4	63										–	–	0											0							0	0
3	19	63	82	86	9	3	71	2	89	2	7	–	–	16	15	2									3	76	1					0	0
4	2	63	80	22	82	12	56	8	64	8	50	–	–	5											1							0	1
4	16	63	80	55	56	7	58	5	82	5	28	–	–	438	11	7	17	4	2	2	21	1	15	1	11	76	2	50	1			0	0
5	7	63	82	87	58	4	26	2	9	2	5	–	–	105	11	5									0							0	0
5	21	63	82	45	80	19	56	9	9	5	22	–	–	133	2	4	11	4	15	1					2							0	0
6	4	63	80	70	82	12	26	3	56	2	13	–	–	177	11	5	2	3	17	2	7	1			8	50	2					0	0
6	18	63	80	28	82	17	56	10	58	8	37	–	–	3040	11	8	22	8	17	7	2	7	21	4	133	50	5					0	0
7	2	63	82	48	80	11	56	10	58	6	25	–	–	888	2	6	11	6	22	5	17	5	18	5	106	50	5	76	2			0	0
7	16	63	58	49	26	18	67	17	82	6	10	–	–	1090	11	7	2	7	22	4	17	3			3							0	0
8	6	63	82	35	58	15	26	14	80	12	24	–	–	3120	11	8	17	7	2	7	18	6	7	5	70	76	4	50	3	51	2	0	0
9	4	63	58	27	56	21	26	9	82	9	34	–	–	2960	11	8	2	7	17	7	21	6	22	5	24	50	3	52	2	76	2		
9	17	63	26	28	56	24	58	20	83	7	21	–	–																					

PLANKTON POPULATION

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN UPPER PORTION-UPPER MISSISSIPPI

STATION LOCATION MISSISSIPPI RIVER LOCK DAM #3 BELOW ST. PAUL, MINNESOTA

27

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	2	62	35900	1030	1140	2830	*	320	110	24370	1310	4090	630	71	7	53	6	50	5	24	4	3	3	12	2	92	2	16	2	51	2	78	1
10	16	62	19200	330	620	2530	250	990	370	12090	1990	4550	700	71	6	69	5	68	4	24	3	51	3	88	3	38	2	25	2	12	2	60	2
11	6	62	10800	70	340	940	0	30	50	8570	720	1550	860	71	6	69	3	24	2	88	2	51	1	17	1	38	1	26	1				
11	20	62	7500	20	20	110	0	250	140	6660	270	500	50	71	6	68	2	51	1														
12	4	62	32800	0	170	870	0	80	120	30600	990	950	0	71	8	68	4	67	2	25	2	69	1	38	1								
12	18	62	12900	330	250	700	0	210	40	10930	460	290	0	71	7	3	2	40	1	17	1	51	1										
1	2	63	5300	420	0	170	0	0	0	4640	110	170	0	71	5	3	2																
1	16	63	2500	0	0	0	0	40	0	2310	170	20	0	71	4	68	1																
2	5	63	100	0	0	0	0	0	0	90	30	50	0																				
2	18	63	700	0	20	0	0	20	190	420	20	80	20	71	1	60	1																
3	4	63	200	0	0	0	0	0	80	110	0	0	20																				
3	19	63	500	0	0	20	0	40	20	350	40	20	20	71	2																		
4	2	63	5800	0	170	290	0	250	950	2980	1160	1790	860	71	5	60	3	68	2	87	1	51	1	88	1	91	1	61	1	17	1	82	1
4	16	63	18500	80	80	420	0	590	0	16130	1220	2270	840	71	4	68	3	65	1	77	1	38	1	88	1	51	1	87	1				
5	7	63	21800	70	70	2660	0	350	240	15220	3210	8140	1030	77	3	38	3	25	2	69	2	24	2	34	2	92	2	51	1	64	1	40	1
5	21	63	22800	0	630	3110	0	670	570	14490	3300	5920	1280	71	7	92	3	26	3	88	3	38	3	17	2	77	2	68	2	24	2	69	2
6	4	63	12700	70	330	1540	0	330	40	9610	810	4380	950	71	6	69	2	68	2	24	2	34	2	25	2	87	1	77	1	65	1	34	1
6	18	63	6900	20	700	680	0	290	90	4430	720	720	320	71	5	12	2	69	2	68	2	11	1	38	1	51	1						
7	2	63	4600	0	130	1170	0	150	200	2330	660	3260	460	71	4	69	3	38	2	26	2	35	1										
7	16	63	3300	40	210	60	0	60	20	2710	230	1180	120	68	3	71	2	38	2														
8	6	63	9000	170	370	2140	*	100	0	4110	370	5710	980	71	5	50	4	68	3	38	2	45	2	15	2	44	1	34	1	35	1	25	1
9	4	63	4400	40	130	2110	0	150	0	1570	340	1630	520	71	3	38	3	68	2	69	2	25	1	34	1	24	1						
9	17	63	8500	50	340	3180	0	320	0	4230	430	2520	140	68	4	71	3	69	3	38	3	25	3	24	2	34	2	15	1	88	1	35	1
10	2	62					* 4750																										
8	6	63					* 1750																										

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN UPPER PORTION—UPPER MISSISSIPPI

STATION LOCATION MISSISSIPPI RIVER LOCK DAM #3 BELOW ST. PAUL, MINNESOTA

27

DATE OF SAMPLE BEGINNING			DATE OF SAMPLE END		GALLONS FILTERED	EXTRACTABLES			CHLOROFORM EXTRACTABLES										
											NEUTRALS								
MONTH	DAY	YEAR	MONTH	DAY		TOTAL	CHLORO-FORM	ALCOHOL	ETHER INSOLUBLES	WATER SOLUBLES	TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	2	62	10	9	3490	261	98	163	2	27	29	2	2	25	0	11	10	2	17
11	6	62	11	13	4029	222	52	170	1	13	23	2	2	19	0	6	2	1	6
12	4	62	12	9	2626	351	67	284	2	18	25	2	3	20	0	7	5	2	8
1	1	63	1	8	4685	221	78	143	-	-	-	-	-	-	-	-	-	-	-
2	5	63	2	12	4143	314	110	204	4	20	45	8	5	32	0	21	6	3	11
3	5	63	3	11	3625	337	120	217	-	-	-	-	-	-	-	-	-	-	-
4	2	63	4	7	2521	355	194	161	2	49	68	4	12	45	7	16	14	4	41
4	14	63	4	21	2586	255	85	170	2	22	32	3	4	22	3	8	4	2	15
4	22	63	4	29	3107	230	91	139	3	26	30	3	4	22	1	9	6	3	14
5	6	63	5	12	2623	283	100	183	6	21	31	2	3	24	2	13	10	2	17
5	13	63	5	20	2820	250	124	126	-	-	-	-	-	-	-	-	-	-	-
5	29	63	6	4	2312	304	107	197	4	27	33	3	3	24	3	14	9	2	18
6	5	63	6	12	3104	195	69	126	-	-	-	-	-	-	-	-	-	-	-
6	25	63	7	2	2833	198	62	136	3	16	23	2	3	17	1	8	5	1	6
7	2	63	7	9	2562	306	124	182	-	-	-	-	-	-	-	-	-	-	-
8	6	63	8	13	2623	264	105	159	7	26	28	3	3	22	0	13	11	2	18
9	3	63	9	10	3502	230	83	147	-	-	-	-	-	-	-	-	-	-	-

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN UPPER PORTION-UPPER MISSISSIPPI

STATION LOCATION MISSISSIPPI RIVER LOCK DAM #3 BELOW ST. PAUL, MINNESOTA 27

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	9	62	15.3	7.2	8.1	3.2	33	5.9	12.6	.3	9	174	204	20	50	34	.4	269	60000
10	16	62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	35000
10	30	62	9.0	8.9	8.2	4.1	30	4.3	12.4	.4	9	–	224	25	35	37	.3	286	60000
11	6	62	5.9	10.3	8.2	3.3	30	7.1	12.5	.2	10	180	218	15	25	32	.4	284	59000
11	14	62	5.6	10.1	8.2	4.5	30	6.6	–	.4	9	180	209	20	30	37	.4	274	31000
11	20	62	3.9	10.4	8.1	4.0	28	7.0	13.5	.4	9	176	208	20	20	29	.4	263	67000
11	27	62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	55000
12	4	62	6.6	10.8	8.1	3.9	27	5.5	12.2	.3	10	188	200	15	20	30	.4	266	7000
12	11	62	.1	12.3	8.0	4.3	27	7.2	13.4	.4	11	190	220	15	15	33	.5	284	47000
12	18	62	.5	10.1	8.2	5.8	29	8.3	15.1	.5	12	188	218	15	15	33	.7	290	–
1	8	63	.4	10.2	7.9	2.8	24	7.8	12.4	.6	9	185	208	15	10	28	.6	283	29000
1	22	63	.1	6.6	7.7	3.7	28	7.6	16.5	.9	12	196	216	10	10	26	.8	288	–
1	29	63	.1	5.5	7.7	4.4	26	11.0	18.3	1.0	12	207	230	15	10	31	1.0	314	–
2	5	63	.1	5.0	7.7	4.8	25	10.8	16.0	1.1	11	196	214	15	10	27	1.0	285	8500
2	13	63	.5	4.2	7.6	4.0	25	10.6	16.0	1.0	18	188	206	15	7	24	.8	269	5000
2	19	63	.1	4.5	7.7	3.8	23	10.9	16.0	1.0	13	195	208	15	9	28	.9	285	110000
2	26	63	.1	5.1	7.8	3.3	29	9.7	14.2	1.0	11	196	200	15	7	27	.8	305	72000
3	5	63	.1	4.1	7.7	2.9	22	10.5	14.8	1.0	11	191	206	10	7	26	–	272	20000
3	12	63	.9	3.7	7.7	3.2	24	10.6	15.1	1.2	18	187	206	10	7	28	.9	297	9000
3	19	63	.9	6.1	7.9	3.6	22	10.3	14.9	1.0	15	176	180	10	6	24	1.0	257	23000
3	27	63	2.6	7.7	7.8	5.6	31	11.4	15.9	1.0	11	163	196	15	25	38	.7	274	14000
4	2	63	8.2	9.4	8.0	5.4	35	9.8	14.6	.7	6	137	172	30	50	36	.3	246	47000
4	9	63	6.5	9.5	8.0	4.6	30	7.9	13.7	.6	7	142	178	20	50	42	.3	286	87000
4	16	63	10.5	10.6	8.3	4.7	34	5.7	13.2	.1	6	138	176	30	75	35	.2	236	85000
4	23	63	8.2	10.9	8.4	4.9	43	4.7	13.6	.1	6	134	164	30	65	32	.2	224	500000
4	30	63	10.5	8.9	8.1	3.2	31	5.0	14.0	.3	7	141	170	25	60	32	.2	228	140000
5	7	63	14.9	9.3	8.2	4.6	34	4.7	14.0	.2	8	153	184	25	90	36	.1	244	22000
5	14	63	13.2	8.5	8.1	4.6	36	6.1	–	.3	8	156	203	25	75	52	.1	274	–
5	21	63	12.9	8.3	8.2	3.5	35	6.7	12.1	.3	6	159	208	30	100	53	.2	282	120000
6	4	63	22.6	7.9	8.2	4.4	41	5.0	13.2	.1	6	147	194	40	90	43	.2	265	20000
6	11	63	20.2	4.9	7.9	4.3	41	7.1	14.7	.4	6	149	192	50	80	47	.3	281	160000
6	18	63	22.4	6.0	8.0	3.8	51	6.9	15.5	.2	5	151	200	50	60	43	.3	281	150000
6	25	63	22.7	6.2	8.0	4.4	42	7.2	15.5	.2	6	168	220	50	75	55	.3	314	–
7	2	63	25.5	4.7	7.9	5.1	34	8.4	14.3	.4	7	166	216	40	40	66	.4	304	10000
7	9	63	24.5	6.8	8.0	4.8	37	7.0	14.2	.2	8	171	220	45	35	53	–	305	10000
7	16	63	23.5	6.4	8.0	4.2	33	7.2	13.7	.3	10	188	248	35	40	58	.4	345	5000
7	23	63	27.4	7.2	8.2	6.5	32	4.7	15.5	.3	14	191	250	30	65	70	.5	361	120000
7	30	63	25.8	4.3	8.3	3.9	24	4.4	14.0	.3	7	165	232	30	90	70	.5	353	–

CHEMICAL. PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN UPPER PORTION-UPPER MISSISSIPPI

STATION LOCATION MISSISSIPPI RIVER LOCK DAM #3 BELOW ST. PAUL, MINNESOTA 27

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
8	6	63	26.0	6.0	8.2	3.6	27	3.5	12.4	.2	7	180	254	30	80	80	.5	352	-
8	13	63	24.0	6.0	8.1	3.0	24	3.5	12.6	.2	7	179	260	30	45	102	.6	388	100000
8	20	63	22.3	7.1	8.1	3.8	29	5.9	12.6	.1	7	168	226	30	50	66	.4	325	*1300
8	27	63	21.8	5.7	8.0	3.6	26	6.3	13.5	.3	8	166	208	30	50	49	.5	302	*1700
9	4	63	20.4	6.0	8.1	4.4	29	7.9	14.0	.4	10	175	210	30	45	53	.6	303	5000
9	10	63	22.1	6.3	8.1	5.3	29	4.7	12.5	.3	8	174	212	25	50	50	.5	305	-
9	17	63	20.0	7.7	8.1	4.2	27	5.0	12.3	.2	9	152	192	20	45	39	.5	267	3800
9	24	63	17.5	7.0	8.1	4.3	28	6.4	12.7	.4	11	166	136	20	55	39	.6	272	20000

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Prescott, Wisconsin
Operated by U.S. Geological Survey

STATE: Minnesota

MAJOR BASIN: Upper Mississippi River

MINOR BASIN: Upper Portion-Upper Mississippi

STATION LOCATION: Mississippi River Lock & Dam #3 below St. Paul, Minnesota

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	5.940	9.270	7.130	5.850	5.080	4.950	21.300	36.900	68.800	18.500	26.000	15.500
2	4.360	9.380	7.160	6.020	5.040	5.410	24.000	35.000	65.300	18.000	24.800	14.400
3	4.710	10.500	7.400	5.930	5.060	5.320	27.400	33.500	62.400	18.600	23.800	15.800
4	6.020	9.980	7.290	5.900	5.110	5.620	31.000	31.600	59.800	19.200	22.800	18.800
5	4.730	11.100	6.940	6.180	5.540	5.990	36.000	30.000	56.000	20.900	21.500	19.100
6	5.570	12.800	7.140	6.290	5.610	6.310	43.800	28.200	51.700	22.900	21.400	18.700
7	6.280	10.900	6.420	5.870	5.720	5.990	51.300	26.000	48.100	25.000	20.800	17.200
8	5.540	9.740	5.100	6.240	5.450	6.170	57.200	24.500	45.400	26.700	20.700	16.300
9	4.860	8.800	4.570	6.160	5.080	6.200	63.300	22.500	43.100	27.400	20.100	17.100
10	6.790	8.390	4.450	5.160	4.710	6.530	67.200	21.700	41.200	28.800	19.900	17.500
11	5.360	8.120	4.460	5.540	4.750	6.480	70.000	21.700	40.300	29.700	19.900	17.300
12	7.190	8.540	5.080	5.010	4.740	7.000	71.500	22.800	38.800	30.700	20.400	17.200
13	5.670	8.150	5.480	5.070	4.870	6.870	71.100	24.200	37.200	30.700	20.000	17.600
14	5.800	7.570	5.740	5.080	5.240	6.670	69.700	24.600	35.600	30.800	19.700	17.500
15	5.160	7.190	5.970	5.260	5.760	7.010	66.800	24.900	34.000	30.800	19.700	17.400
16	5.150	7.730	6.490	5.230	5.630	7.350	64.000	27.300	32.200	30.600	19.900	17.300
17	5.150	7.100	6.460	5.160	5.710	7.600	61.600	29.200	30.300	30.500	19.600	18.100
18	5.980	6.680	6.600	5.110	5.590	7.660	58.300	30.400	29.400	29.700	18.600	18.600
19	6.320	6.380	6.680	5.030	5.350	7.310	51.900	32.100	28.000	29.900	17.500	18.100
20	7.030	6.510	6.080	5.110	5.430	7.960	53.800	33.000	26.900	30.700	17.200	16.800
21	7.430	6.820	6.350	5.100	5.440	7.940	52.800	33.400	26.600	29.800	16.000	16.300
22	8.540	8.080	5.950	4.910	5.430	8.230	51.300	35.700	26.600	29.900	16.200	15.500
23	5.710	7.610	6.530	4.730	5.530	8.460	49.500	39.400	26.500	29.900	17.100	14.600
24	6.100	6.930	6.830	4.870	5.440	8.270	48.200	46.700	26.000	29.700	17.500	13.900
25	3.680	8.460	6.920	4.580	5.440	10.600	46.400	57.000	24.600	29.900	15.200	14.000
26	5.740	5.060	6.990	4.470	5.460	9.930	45.400	65.500	23.100	29.600	14.800	13.300
27	8.120	6.800	6.310	4.420	5.400	10.700	44.100	71.200	22.500	29.100	14.400	13.200
28	6.860	7.020	5.990	4.430	5.860	13.300	42.100	74.400	20.900	29.000	13.600	14.100
29	9.040	7.070	5.650	4.720		15.300	40.000	75.800	20.700	28.000	13.500	14.100
30	7.270	6.950	5.680	5.050		15.700	39.000	74.600	20.200	27.800	14.300	14.000
31	6.460		5.930	5.110		19.200		71.900		26.800	16.300	

RAINY RIVER AT BAUDETTE, MINNESOTA

Samples at this station are collected from the intake of the municipal power plant. The Rainy River forms the boundary between central Minnesota and Ontario, and the station is approximately 19 miles above the point where Rainy River turns north and empties into Lake-of-the-Woods.

Pulp and paper mill wastes are discharged to the river in the International Falls, Minnesota-Fort Frances, Ontario area, approximately 75 miles upstream. International Falls discharges treated municipal wastes from a sewered population of 6,100 using secondary treatment. Ft. Frances has a treatment plant under construction. Peat bog drainage from tributaries causes high color readings at this station.

There is considerable recreational fishing and boating on Rainy River and Lake-of-the-Woods in the vicinity of this station.

Station Location: Rainy River at Baudette, Minnesota

Major Basin: Upper Mississippi River

Minor Basin: Rainy River

Station at: 48°44' Latitude 94°36' Longitude

Miles above mouth: 9

Activation Date: September 27, 1961

Sampled by: Baudette Light and Power Company

Field Analysis by: U.S. Public Health Service

Other Cooperating Agencies: Minnesota State Department of Health

Hydrologic Data:

Nearest pertinent gaging station: At Manitou Rapids, Minnesota

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 19,400 square miles

Period of record: 1928 to present

Average discharge in record period: 11,800 cfs.

Maximum discharge in record period: 71,600 cfs.

Minimum discharge in record period: 929 cfs.

Remarks: Diurnal variations in flows caused by operation of power plant upstream. Partial regulation at low and medium flows by Namakon and Rainy Lakes.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.15	.15
	Na	6.0	3.4
	K	2.2	1.3
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	380	120
	Cd	*2	*2
	As	*10	*10
	B	36	6
	P	181	23
	Fe	49	38
	Mo	57	11
	Mn	257	3
	Al	—	5
	Be	*.05	*.02
	Cu	112	18
	Ag	*.4	*.2
	Ni	42	2
	Co	*4	*2
	Pb	14	*2
	Cr	*1	*2
	V	*2	*5
	Ba	30	8
	Sr	59	12

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	2.2	.3	April to June	2.5	.3
January to March	–	–	July to September	4.7	.8

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.

See page 21.

RADIOACTIVITY DETERMINATIONS

STATE

MAJOR BASIN

MINOR BASIN

STATION LOCATION

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER														RADIOACTIVITY IN PLANKTON				
			DATE OF DETERMINATION	ALPHA					BETA								DATE OF DETERMINATION	GROSS ACTIVITY			
				SUSPENDED		DISSOLVED		TOTAL	SUSPENDED		DISSOLVED		TOTAL					ALPHA		BETA	
MO	DAY	YR	MO DAY	pc l	±	pc l	±	pc l ±	pc l	±	pc l	±	pc l	±			MO DAY	pc g	±	pc g	±

PLANKTON POPULATION

STATE MINNESOTA
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN RAINY RIVER
STATION LOCATION RAINY RIVER AT
BAUDETTE, MINNESOTA 096

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA Number per ml	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH				ROTIFERS										CRUSTACEA											
														GENERA AND COUNT LEVEL (See text for Codes)										GENERA AND COUNT LEVEL (See text for Codes)									
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT		PROTOZOA (Number per ml)	NUMBER PER LITER	1ST		2ND		3RD		4TH		5TH		NUMBER PER LITER	1ST		2ND		3RD		NEMATODES (Number per liter)	OTHER ANIMAL FORMS (Number per liter)
															GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		
10	1	62	25	39	47	23	24	6	56	5	25	120	-	12	11	2									0							0	0
10	15	62	82	18	58	18	80	15	92	9	40	-	-	71	11	4	17	2							0							0	0
11	5	62	57	3	56	15	9	16	82	9	37	-	-	11	11	1									0							0	0
11	19	62	56	29	57	13	9	13	80	12	33	150	-	6	11	1									0							0	0
12	3	62	56	36	57	16	82	11	80	8	29	20	-	1											1							0	0
12	17	62	82	18	56	17	82	14	9	9	42	80	-	3											4							0	0
1	7	63	82	22	57	17	38	9	56	6	46	-	-	2											1							0	0
1	21	63										70	-	1											0							0	0
2	4	63	82	32	56	20	9	6	80	4	40	110	-	2											0							0	0
2	18	63	61	26	60	12	58	9	9	7	46	-	-	1											47	77	5					0	0
3	4	63	56	22	82	19	9	8	56	6	45	-	-	1											12	77	3					0	0
3	18	63	82	17	60	13	56	12	9	12	46	-	-	3											0							0	0
4	1	63	60	31	82	16	56	9	57	6	38	-	-	1											0							0	0
4	15	63	60	84	82	5	56	3	92	2	6	-	-	2											1							0	0
5	6	63	60	69	82	10	47	6	9	5	10	-	-	-											-							-	-
5	24	63	27	31	60	32	92	19	61	7	21	-	-	-											-							-	-
6	3	63	60	50	92	24	71	5	56	4	16	-	-	-											-							-	-
6	17	63	26	26	82	20	56	11	70	6	37	-	-	-											-							-	-
8	5	63										-	-	-											-							-	-
8	19	63										-	-	-											-							-	-
9	2	63										-	-	-											-							-	-
9	16	63										-	-	-											-							-	-

PLANKTON POPULATION

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT BAUDETTE, MINNESOTA 96

DATE OF SAMPLE			ALGAE (Number per milliliter)								INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS			1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEP	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	1900	0	0	0	0	0	80	1080	740	90	210	84	1	77	1	68	2	69	2										
10	15	62	400	0	10	10	0	0	0	190	200	60	20																		
11	5	62	800	230	60	40	0	0	20	370	80	0	80	69	1																
11	19	62	1100	0	60	20	0	40	100	520	360	40	80	69	2																
12	3	62	100	0	0	0	0	0	0	30	80	30	50																		
12	17	62	300	0	0	30	0	10	0	140	110	40	10																		
1	7	63	400	0	0	0	0	0	0	230	140	0	0																		
1	21	63	200	0	30	40	0	60	0	40	70	80	30																		
2	4	63	200	0	40	40	0	10	0	70	30	80	50																		
2	18	63	100	0	10	0	0	0	30	10	0	40	10																		
3	4	63	100	0	0	0	0	0	50	30	0	30	30																		
3	18	63	100	0	10	0	0	0	10	10	10	80	0																		
4	1	63	100	0	0	0	0	0	0	70	40	40	70																		
4	15	63	200	0	0	20	0	20	0	90	80	0	80																		
5	6	63	2000	0	170	40	0	60	130	780	860	230	0	71	3	77	2														
5	20	63	500	0	0	20	0	110	0	200	150	40	40	69	1																
6	3	63	800	0	20	0	0	0	0	310	440	90	330	69	2	92	2														
6	17	63	700	0	110	0	0	0	0	250	360	80	150	69	1																
8	5	63	900	220	90	120	0	0	30	270	220	100	320	1	1																
8	19	63	300	0	70	40	20	0	0	150	20	70	130																		
9	2	63	600	0	110	90	0	20	0	220	130	260	40																		
9	16	63	600	0	80	20	0	0	0	350	190	100	120	69	1																

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT BAUDETTE, MINNESOTA

96

DATE OF SAMPLE					GALLONS FILTERED	EXTRACTABLES			CHLOROFORM EXTRACTABLES									
BEGINNING			END								NEUTRALS							
MONTH	DAY	YEAR	MONTH	DAY		TOTAL	CHLORO-FORM	ALCOHOL	ETHER INSOLUBLES	WATER SOLUBLES	TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	8	62	10	15	4610	217	57	160	1	15	17	1	1	14	1	8	4	1	11
11	12	62	11	19	4670	214	104	110	1	24	32	1	2	24	5	21	8	1	17
12	10	62	12	17	4720	259	35	224	2	8	12	1	1	10	0	4	2	1	6
1	14	63	1	21	4090	378	154	224	6	40	34	3	5	26	0	25	15	2	32
4	8	63	4	15	3960	171	55	116	1	13	18	1	2	15	0	9	4	1	9
5	13	63	5	20	4560	227	117	110	5	27	24	1	2	19	2	25	10	2	24
6	10	63	6	17	4090	209	85	124	3	22	23	2	2	19	0	12	7	2	16
7	8	63	7	15	4410	315	164	151	6	56	28	1	2	25	0	23	24	2	25
8	12	63	8	19	4600	412	154	258	3	53	27	1	3	21	2	18	20	2	31
9	9	63	9	16	4390	448	180	268	15	51	31	1	3	26	1	27	26	2	28

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT BAUDETTE, MINNESOTA 96

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
6	10	63	-	-	-	-	-	-	-	-	5	50	76	140	*25	4	.0	110	-
6	17	63	-	-	-	-	-	-	-	-	7	40	64	90	*25	4	.0	110	-
6	24	63	-	-	-	-	-	-	-	-	5	42	50	50	*25	7	.0	93	-
7	1	63	-	-	-	-	-	-	-	-	5	34	70	60	*25	10	.0	80	-
7	8	63	-	-	-	-	-	-	-	-	6	32	56	50	*25	9	.0	70	-
7	15	63	-	-	-	-	-	-	-	-	5	40	90	90	*25	7	.1	93	-
7	22	63	-	-	-	-	-	-	-	-	6	42	64	65	*25	7	.0	81	-
7	29	63	-	-	-	-	-	-	-	-	7	34	80	50	*25	8	.0	81	-
8	5	63	-	-	-	-	-	-	-	-	8	34	90	60	*25	8	.0	87	-
8	12	63	-	-	-	-	-	-	-	-	5	32	42	40	*25	6	.0	76	-
8	19	63	-	-	-	-	-	-	-	-	5	44	52	40	*25	7	.0	89	-
8	26	63	-	-	-	-	-	-	-	-	4	32	48	60	*25	5	.0	74	-
9	2	63	-	-	-	-	-	-	-	-	3	34	48	60	*25	5	.0	77	-
9	9	63	-	-	-	-	-	-	-	-	3	34	44	50	*25	7	.0	77	-
9	16	63	-	-	-	-	-	-	-	-	2	32	44	40	*25	2	.0	70	-
9	23	63	-	-	-	-	-	-	-	-	3	32	42	40	*25	4	.0	85	-
9	30	63	-	-	-	-	-	-	-	-	3	30	42	50	*25	4	.0	86	-

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Manitou Rapids, Minnesota
Operated by U.S. Geological Survey

STATE: Minnesota

MAJOR BASIN: Upper Mississippi River

MINOR BASIN: Rainy River

STATION LOCATION: Rainy River at Baudette, Minnesota

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	11.300	9.960	8.900	6.800	8.500	8.700	6.800	10.500	17.800	28.700	25.100	12.000
2	11.800	10.100	8.230	7.200	8.850	8.600	8.800	11.000	17.800	28.300	24.900	10.400
3	11.800	9.730	5.540	8.000	8.800	8.600	12.000	11.200	16.200	27.600	24.500	9.660
4	11.700	9.150	7.440	9.000	7.950	8.600	16.000	10.400	18.500	24.400	23.900	11.000
5	11.700	5.490	8.640	9.000	8.100	8.600	21.000	9.410	19.900	23.500	22.600	11.600
6	11.600	7.760	8.770	7.600	8.450	9.200	20.600	7.120	19.900	22.600	22.500	11.600
7	11.300	9.110	8.790	7.000	8.550	9.500	18.300	8.100	18.800	22.300	20.600	11.600
8	9.910	9.340	8.710	8.400	8.700	9.600	12.500	8.770	17.800	21.600	17.800	11.300
9	10.600	9.180	8.060	8.800	8.750	9.500	13.600	9.150	16.300	20.800	17.800	8.380
10	11.300	9.080	6.750	9.000	8.650	9.300	13.400	9.430	13.700	16.600	17.800	9.820
11	11.100	6.900	5.200	9.000	7.500	9.000	12.900	9.040	15.600	14.800	17.500	10.900
12	11.000	4.830	8.500	9.000	8.050	9.500	12.300	8.950	21.400	15.900	16.700	13.800
13	10.700	5.620	8.600	8.800	8.600	9.600	11.900	6.840	24.200	19.000	17.200	11.100
14	10.400	7.980	8.600	7.600	8.600	9.600	9.890	8.860	25.000	20.200	17.500	11.000
15	8.820	9.410	8.500	8.200	8.600	9.600	7.640	10.000	24.800	19.600	17.500	10.900
16	9.130	9.540	8.350	8.700	8.300	9.700	7.560	10.400	23.900	19.800	17.800	9.960
17	10.300	9.730	4.800	8.700	8.000	9.700	10.000	10.900	21.800	19.700	18.300	10.400
18	10.300	9.040	6.900	8.700	5.500	9.500	11.400	11.100	21.300	19.400	18.400	11.400
19	10.100	5.320	8.290	8.700	6.500	9.400	11.400	10.400	22.200	19.200	17.400	11.600
20	10.000	7.200	8.350	8.200	8.000	9.500	10.800	7.880	23.200	19.400	17.100	11.600
21	9.840	9.360	8.200	7.600	8.400	9.400	10.300	9.410	27.400	19.300	13.700	11.300
22	6.160	9.200	8.100	7.150	8.600	9.400	7.700	10.200	29.100	18.100	12.300	10.200
23	7.700	7.160	6.400	8.000	8.600	9.500	8.380	10.200	28.800	18.600	11.900	7.440
24	9.150	8.200	4.600	8.500	8.500	9.400	9.940	10.200	28.200	18.500	12.100	8.510
25	9.800	8.460	4.200	8.700	7.800	7.600	10.000	9.820	27.900	18.300	12.000	10.100
26	9.980	5.220	4.100	8.800	8.300	7.900	9.890	9.340	28.100	18.300	10.200	10.600
27	9.840	7.160	6.600	8.450	8.700	7.800	10.200	6.880	29.100	18.100	10.700	10.600
28	9.450	8.770	8.350	7.000	8.700	7.400	10.400	9.380	29.400	18.500	11.800	10.500
29	6.010	9.110	8.550	7.800		7.400	7.340	13.600	29.300	19.200	12.100	9.800
30	7.820	9.110	8.500	8.400		7.400	8.970	15.800	29.100	23.100	12.300	6.450
31	9.500		7.400	8.400		7.500		16.500		24.900	12.300	

RAINY RIVER AT INTERNATIONAL FALLS, MINNESOTA

The Rainy River flows a distance of approximately 70 miles from Rainy Lake to Lake-of-the-Woods, and forms the international border between Ontario and Minnesota. This station is located a short distance downstream from the outlet of Rainy Lake. Samples are collected at the pump house intake of the Minnesota and Ontario Paper Company. This plant also provides municipal supplies to the city of International Falls.

Pulp and paper mills at Fort Frances, Ontario and International Falls, Minnesota utilize about 83 million gallons per day for processing pulpwood. There is little recreational use of the river from International Falls to Baudette, Minnesota, the next downstream sampling station.

There has been an increase in the relatively low coliform levels at this station since it was initiated in 1961.

	Median Coliform Levels/100 ml.	
Water Year	1962	1963
Autumn	50	83
Winter	27	440
Spring	80	570
Summer	140	480

Station Location: Rainy River at International Falls, Minnesota

Major Basin: Upper Mississippi River

Minor Basin: Rainy River

Station at: 48°36' Latitude 93°26' Longitude

Miles above mouth: 70

Activation Date: November 20, 1961

Sampled by: Minnesota and Ontario Paper Company

Field Analysis by: Minnesota and Ontario Paper Company

Other Cooperating Agencies: Minnesota State Department of Health

Hydrologic Data:

Nearest pertinent gaging station: International Falls, Minnesota

Gaging station operated by: International Joint Commission

Drainage area at gaging station: 14,900 square miles

Period of record: 1912 to present

Average discharge in record period: 9,100 cfs.

Maximum discharge in record period: Not available

Minimum discharge in record period: Not available

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	–	.10
	Na	–	1.6
	K	–	.8
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	75	38
	Cd	*1	*2
	As	*5	*10
	B	10	15
	P	35	13
	Fe	63	8
	Mo	*1	4
	Mn	.5	1
	Al	–	3
	Be	*.01	*.01
	Cu	20	12
	Ag	*.1	*.1
	Ni	*1	*3
	Co	*1	*2
	Pb	16	*2
	Cr	*1	*2
	V	*1	*3
	Ba	16	6
	Sr	21	7

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	1.8	.2	April to June	2.9	.3
January to March	–	–	July to September	4.3	.8

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT INTERNATIONAL FALLS, MINNESOTA 101

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER														RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						DATE OF DETERMINATION		GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO	DAY	pc/g	±	pc/g	±
10	2	62	12	14	0	0	0	0	0	0	6	5	20	6	26	8						
10	8	62	12	14	0	0	0	1	0	1	1	5	22	7	23	9						
10	15	62	11	7	0	0	0	0	0	0	3	5	18	5	21	7						
11	5	62	11	30	0	0	0	0	0	0	6	5	19	6	25	8						
11	19	62	12	6	0	0	0	0	0	0	4	6	18	5	22	8						
11	26	62	12	15	1	1	0	1	1	1	2	5	25	5	27	7						
12	3	62	12	29	0	0	1	1	1	1	5	6	22	6	27	8						
12	31	62	1	15	0	0	1	1	1	1	4	6	25	6	29	8						
1	28	63	2	21*	0	0	0	1	0	1	5	6	24	7	29	9						
2	25	63	3	22*	0	1	0	1	0	1	2	6	22	6	24	8						
3	25	63	4	22*	0	0	0	0	0	0	3	3	56	4	59	5						
4	29	63	5	31*	0	0	0	0	0	0	10	3	36	4	46	5						
5	26	63	6	25*	0	0	0	0	0	0	14	4	48	5	62	6						
6	24	63	7	30*	0	1	0	1	0	1	24	6	54	7	78	9						
7	29	63	8	23*	0	0	0	0	0	0	17	6	61	7	78	9						
8	26	63	10	4*	0	0	1	1	1	1	11	5	66	7	77	9						
9	30	63	11	6*	0	0	0	1	0	1	8	6	49	7	57	9						

PLANKTON POPULATION

STATE MINNESOTA
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN RAINY RIVER
STATION LOCATION RAINY RIVER AT INTERNATIONAL FALLS, MINNESOTA 101

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA (Number per ml)	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH				ROTIFERS												CRUSTACEA										
														GENERA AND COUNT LEVEL (See text for Codes)											GENERA AND COUNT LEVEL (See text for Codes)									
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT		PROTOZOA (Identifiable) (Number per ml)	NUMBER PER LITER	1ST GENUS	1ST COUNT LEVEL	2ND GENUS	2ND COUNT LEVEL	3RD GENUS	3RD COUNT LEVEL	4TH GENUS	4TH COUNT LEVEL	5TH GENUS	5TH COUNT LEVEL	NUMBER PER LITER	1ST GENUS	1ST COUNT LEVEL	2ND GENUS	2ND COUNT LEVEL	3RD GENUS	3RD COUNT LEVEL	NEMATODES (Identifiable) (Number per liter)	OTHER ANIMAL FORMS (Number per liter)
10	1	62	46	35	82	28	56	8	83	6	23		-	212	11	5	17	4	21	4	22	2			19	50	2	76	2	53	1	0	0
10	15	62	82	25	58	20	95	16	56	8	31		-	69	17	3	11	3	22	1					19	50	3	76	1	77	1	0	0
11	5	62	61	35	56	11	95	9	57	8	37		-	84	11	4	17	3	7	2					12	50	2	76	1			0	0
11	19	62	50	40	82	20	57	12	9	11	17	50	-	20	11	2									4							0	0
12	3	62	95	51	47	17	82	7	35	6	19	50	-	0											0							0	0
12	17	62	82	40	9	11	57	10	61	10	29		-	5											0							0	0
1	2	63	84	32	56	22	57	11	9	7	28		-	0											1							0	0
1	21	63	82	52	57	10	9	8	56	5	25		-	0											0							0	0
2	4	63	9	19	61	15	82	11	27	9	46		-	4											0							1	0
2	18	63											-	1											1							0	0
3	4	63	82	25	56	23	60	15	9	8	29		-	2											0							0	0
3	18	63											-	0											0							0	0
4	1	63	60	92	9	2	82	2	92	1	3		-	0											0							0	0
4	15	63	60	74	56	9	82	8	47	1	8		-	1											3							0	0
5	6	63	60	37	9	17	82	15	56	14	17	20	-	-											-							-	-
5	21	63	60	55	56	10	9	9	82	9	17		-	-											-							-	-
6	3	63	60	33	9	21	91	12	61	8	26		-	-											-							-	-
6	18	63	9	35	95	17	56	7	58	6	35		-	-											-							-	-
8	5	63											-	-											-							-	-
8	19	63											-	-											-							-	-
9	3	63											-	-											-							-	-
9	16	63											-	-											-							-	-

PLANKTON POPULATION

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT INTERNATIONAL FALLS, MINNESOTA 101

DATE OF SAMPLE			ALGAE (Number per milliliter)										INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	800	0	0	120	0	40	0	460	170	170	120																			
10	15	62	300	10	0	100	0	0	10	60	110	70	70																			
11	5	62	700	0	0	0	0	0	0	540	170	80	40	69	2																	
11	19	62	200	0	0	0	0	0	0	90	90	0	0																			
12	3	62	500	0	0	0	0	20	0	230	240	60	30	69	1																	
12	17	62	600	0	0	0	0	0	40	310	270	40	0	69	1																	
1	2	63	00	0	0	0	0	0	0	30	10	0	0																			
1	21	63	00	0	0	0	0	0	0	0	0	0	0																			
2	4	63	100	0	0	0	0	0	0	50	50	20	0																			
2	18	63	500	0	30	0	0	90	270	70	30	40	60	60	1																	
3	4	63	100	0	0	0	0	20	20	20	30	20	0																			
3	18	63	00	0	10	0	0	0	0	30	0	10	0																			
4	1	63	200	0	0	0	0	0	10	100	40	30	0																			
4	15	63	200	0	0	0	0	60	0	140	30	30	20																			
5	6	63	500	0	40	0	0	20	60	340	80	150	20																			
5	21	63	300	0	20	20	0	0	20	150	90	40	110																			
6	3	63	600	0	60	60	0	20	60	80	290	80	80																			
6	18	63	200	0	0	20	0	0	0	20	120	20	40																			
8	5	63	100	0	0	0	0	0	0	130	0	0	0																			
8	19	63	200	0	20	0	0	0	0	130	90	70	0																			
9	3	63	200	0	0	20	0	0	20	130	20	0	90																			
9	16	63	200	0	0	0	0	0	0	220	20	110	20	69	1																	

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT INTERNATIONAL FALLS, MINNESOTA 101

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	2	62	10	17	5062	245	78	167	1	24	14	1	1	11	1	8	8	2	21
11	5	62	11	20	5160	256	83	173	2	27	16	1	0	14	1	8	8	2	20
12	3	62	12	19	5224	318	111	207	17	30	17	1	1	15	0	9	10	1	27
12	31	62	1	16	5256	259	49	220	-	-	-	-	-	-	-	-	-	-	-
2	4	63	2	19	5232	279	93	186	8	31	13	0	1	11	1	7	8	3	23
3	4	63	3	19	5255	286	162	124	-	-	-	-	-	-	-	-	-	-	-
4	1	63	4	16	5237	229	104	125	4	30	20	1	1	16	2	12	12	1	25
5	1	63	5	16	5175	335	175	160	-	-	-	-	-	-	-	-	-	-	-
6	3	63	6	18	5241	288	148	140	15	44	19	1	1	16	1	14	19	2	35
7	1	63	7	17	5248#	244	119	125	-	-	-	-	-	-	-	-	-	-	-
8	5	63	8	20	4957	300	124	176	2	40	22	1	2	18	1	9	16	2	33
9	4	63	9	19	5141	229	86	143	-	-	-	-	-	-	-	-	-	-	-
9	30	63	10	15	5232	220	76	144	5	21	14	0	1	12	1	9	7	1	19

ESTIMATED

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT INTERNATIONAL FALLS, MINNESOTA 101

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	1	62	12.1	9.6	7.0	1.0	26	6.2	13.3	.6	-	19	21	28	1	6	-	49	*3
10	8	62	14.0	9.7	7.0	.9	25	5.4	11.2	.5	-	19	20	26	1	6	-	50	-
10	9	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	15	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	5	62	3.9	11.4	6.9	1.5	30	5.4	11.3	.5	-	17	19	46	2	6	-	-	100
11	12	62	3.4	11.2	6.9	1.2	-	-	-	-	-	-	-	-	-	-	-	-	320
11	19	62	1.0	12.0	6.9	1.3	41	4.6	10.9	.6	-	19	21	35	1	6	-	24	87
11	26	62	1.2	11.8	7.0	1.1	38	4.2	11.0	.6	-	18	22	24	1	7	-	59	120
12	3	62	2.5	12.5	7.0	1.0	32	5.0	12.6	.6	-	19	22	-	1	6	-	53	60
12	10	62	.2	13.2	6.9	.7	28	4.5	-	.6	-	19	19	31	1	6	-	49	20
12	17	62	.4	13.0	6.8	.6	29	4.6	-	.6	-	19	20	27	1	6	-	49	50
12	31	62	.3	12.9	6.8	.7	28	4.6	-	.6	-	19	20	28	1	6	.0	47	30
1	7	63	.6	13.0	7.1	1.0	40	5.0	12.6	.6	-	17	22	28	1	6	.0	47	50
1	14	63	.3	12.1	7.0	.9	36	5.4	11.9	.6	-	17	22	24	1	6	.0	53	120
1	21	63	.3	-	7.0	-	30	4.3	12.5	.6	-	18	22	26	1	6	-	57	20
1	28	63	.3	12.6	7.0	1.2	32	5.4	12.3	.6	-	18	21	30	1	6	-	60	87
2	4	63	.5	12.7	7.0	1.1	36	5.7	11.7	.6	-	18	22	30	1	6	-	52	510
2	11	63	.5	12.7	7.0	.8	32	5.7	11.9	.6	1	19	21	24	1	5	.1	55	440
2	18	63	.2	12.8	7.0	.8	25	5.7	11.9	.6	-	19	20	29	1	6	-	68	280
2	25	63	.0	12.7	7.0	1.3	-	4.8	-	.6	-	19	21	29	1	6	.1	59	730
3	4	63	-	-	-	-	-	-	-	-	-	19	22	32	1	5	-	56	430
3	11	63	.7	12.9	7.0	.6	28	5.1	11.7	.6	-	-	-	-	-	-	-	-	480
3	18	63	.6	12.8	7.0	.9	32	5.5	11.8	.5	-	20	23	26	1	6	-	48	200
3	25	63	1.7	12.6	6.9	1.4	32	5.2	12.8	.6	-	19	23	33	1	6	-	46	500
4	1	63	2.7	12.4	7.0	1.2	42	5.5	12.9	.5	-	20	24	36	2	6	-	52	2400
4	8	63	-	-	-	-	-	-	-	-	-	19	20	22	2	6	-	-	-
4	15	63	4.6	12.8	7.0	1.4	-	5.8	13.1	.6	-	-	-	-	-	-	-	-	-
4	22	63	4.0	12.9	7.1	2.6	-	-	-	.6	-	20	21	38	2	6	-	-	3400
4	29	63	5.6	12.8	7.1	2.7	27	5.1	-	.6	-	20	20	27	1	6	-	-	-
4	30	63	-	-	-	2.3	-	-	-	.6	-	19	21	36	1	6	-	58	1400
5	6	63	7.0	12.4	7.1	-	-	-	-	.6	-	20	21	21	1	6	-	50	640
5	13	63	8.4	11.8	7.0	1.4	37	4.0	9.6	.6	-	-	-	-	-	-	-	52	-
5	26	63	-	-	-	2.6	33	4.6	10.7	.6	-	19	21	24	1	6	-	-	80
6	3	63	-	-	-	-	-	-	-	-	-	19	20	24	2	6	-	40	160
6	10	63	17.0	9.7	7.0	1.4	45	4.8	12.9	.6	-	-	-	-	-	-	-	48	-
6	18	63	16.2	8.9	7.0	1.2	59	-	12.0	-	-	18	23	33	2	6	-	-	800
6	24	63	15.7	9.1	7.0	1.6	34	6.9	14.1	.6	-	22	17	24	2	6	-	52	1000
												17	17	30	2	6	-	51	210
																		64	200
																			500

CHEMICAL. PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MINNESOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RAINY RIVER

STATION LOCATION RAINY RIVER AT INTERNATIONAL FALLS, MINNESOTA 101

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	1	63	19.6	7.5	7.0	.7	34	5.6	12.7	.6	-	15	22	41	1	6	-	57	3000
7	8	63	23.2	7.1	7.1	1.1	35	6.1	13.7	.6	-	15	23	34	1	6	-	45	400
7	15	63	19.8	7.5	7.0	1.4	33	5.5	13.4	.6	-	18	20	32	1	6	-	56	950
7	22	63	22.4	7.2	7.0	1.3	30	6.2	13.6	-	-	17	19	31	2	-	-	66	500
7	29	63	21.6	7.4	7.0	1.1	29	5.1	12.6	.6	-	17	20	33	2	6	-	51	1200
8	5	63	21.7	7.3	7.0	1.1	36	5.9	13.0	.7	-	19	20	28	1	6	-	58	170
8	12	63	22.1	6.8	7.0	1.1	-	-	-	-	-	16	20	29	2	-	-	55	300
8	19	63	19.6	6.6	6.9	1.4	33	5.7	13.7	.7	-	19	21	22	1	6	-	65	410
8	26	63	19.7	7.3	7.1	1.4	37	5.2	12.6	.8	-	17	22	33	1	7	-	55	160
9	3	63	19.6	7.6	7.2	.9	42	4.9	11.7	.6	-	18	20	30	1	7	-	51	600
9	9	63	19.4	7.7	7.0	.8	-	5.3	-	.6	-	18	20	26	1	6	-	51	460
9	16	63	17.3	7.7	7.1	1.2	-	-	-	-	-	19	28	22	2	-	-	-	500
9	23	63	15.9	7.9	7.0	1.4	33	5.8	10.1	.5	-	12	21	29	1	6	-	54	300
9	30	63	15.7	8.2	7.2	.9	26	4.9	10.4	.6	-	15	24	24	2	6	-	60	900

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at International Falls, Minnesota
Data Supplied by International Joint Commission

STATE: Minnesota

MAJOR BASIN: Upper Mississippi River

MINOR BASIN: Rainy River

STATION LOCATION: Rainy River at International Falls, Minnesota

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	11.200	8.890	7.210	6.950	5.450	8.460	6.480	7.140	6.450	25.300	21.000	8.360
2	10.500	8.370	2.720	8.420	8.670	8.310	7.550	7.230	3.790	28.600	21.700	7.600
3	10.200	8.000	7.960	8.250	6.150	8.320	7.600	6.330	7.510	22.400	21.600	10.500
4	10.500	1.850	7.920	8.310	8.370	8.360	7.780	5.680	8.490	21.400	20.100	10.600
5	10.400	8.110	7.950	6.250	7.590	9.200	7.060	2.750	9.180	21.200	21.600	10.600
6	9.890	8.450	7.880	5.580	8.220	9.550	7.010	5.240	9.350	21.100	17.100	10.700
7	7.830	8.180	7.440	8.340	8.390	9.380	.880	5.240	10.100	20.400	15.600	10.700
8	10.300	8.120	4.750	7.930	8.290	9.290	6.540	5.720	10.100	20.400	16.400	6.920
9	10.300	8.290	2.760	8.400	8.420	9.260	6.980	5.910	6.600	13.900	16.700	9.700
10	9.940	4.660	3.410	8.420	6.310	8.220	7.250	5.280	9.880	12.600	16.600	10.700
11	9.840	2.610	7.950	8.100	8.400	9.380	7.260	6.040	14.900	12.700	15.300	10.700
12	9.930	4.480	7.880	8.300	8.490	9.370	6.670	3.000	16.200	15.700	16.200	10.300
13	9.580	8.320	8.050	5.640	8.650	9.220	5.600	6.140	17.600	16.500	16.600	10.200
14	7.120	8.600	7.550	7.660	8.410	9.310	3.010	6.360	18.200	15.600	16.400	10.100
15	8.260	8.590	7.880	8.280	8.340	9.370	3.950	5.700	18.200	16.500	16.400	8.790
16	9.330	8.680	1.570	8.380	7.470	9.500	6.740	5.990	16.200	16.600	16.300	9.860
17	9.290	8.570	7.440	8.300	2.690	8.700	7.470	6.110	16.400	16.500	16.500	10.500
18	9.060	2.050	7.870	8.230	5.980	9.420	6.630	5.860	18.100	16.600	15.200	10.400
19	9.190	7.770	7.890	7.830	8.200	9.370	6.270	2.130	18.300	16.400	15.500	10.500
20	9.170	8.470	7.700	6.470	7.640	9.190	6.240	5.700	23.500	16.500	10.200	10.100
21	2.410	8.070	7.450	5.960	7.900	9.230	2.140	5.990	25.800	15.200	10.000	9.330
22	7.640	4.790	4.930	8.330	8.550	8.540	4.880	5.830	25.900	16.400	10.200	5.300
23	8.260	8.490	2.120	8.350	8.220	8.490	6.720	6.000	25.500	16.500	10.700	8.090
24	8.710	8.210	2.170	8.450	6.990	4.580	6.620	6.040	25.100	16.400	10.700	9.200
25	8.690	2.380	2.420	8.420	8.260	7.710	6.320	5.800	25.800	16.400	7.530	9.480
26	8.560	7.550	7.550	8.280	8.310	7.620	6.790	2.600	27.000	16.400	9.600	9.920
27	8.810	7.680	7.420	5.870	8.420	6.990	6.740	5.790	27.700	16.400	10.700	9.490
28	2.590	7.850	7.790	8.520	8.440	7.000	2.460	5.760	28.500	15.900	10.600	9.330
29	7.710	7.920	7.460	8.190		7.120	5.910	5.820	28.700	20.800	10.700	4.530
30	8.670	7.650	5.700	7.550		6.990	6.840	6.240	28.600	21.900	10.700	8.120
31	8.760		5.740	8.430		3.890		7.040		21.600	10.500	

RED RIVER (NORTH) AT GRAND FORKS, NORTH DAKOTA

Samples are collected from the intake of the municipal water treatment plant. The river is shallow and slow moving, with considerable peat bog drainage upstream from the station.

Fargo, North Dakota, approximately 80 miles upstream, discharges primary sewage treatment plant effluent with a BOD population equivalent of 20,000. Industrial wastes are discharged to the Red River of the North from sugar beet and potato processing plants. Agricultural activity in the watershed consists primarily of small grain crops, potatoes and livestock.

The Strontium-90 activity of 11.3 pico-curies per liter found in the July-September 1963 composite is attributable to fallout. (See page 6.)

736-497 O - 64 - 8

Station Location: Red River (North) at Grand Forks, North Dakota

Major Basin: Upper Mississippi River

Minor Basin: Red River of the North

Station at: 47°55' Latitude 97°01' Longitude

Miles above mouth: 299

Activation Date: September 8, 1960

Sampled by: Grand Forks City Water Department

Field Analysis by: Grand Forks City Water Department
U.S. Public Health Service

Other Cooperating Agencies: North Dakota State Department of Health

Hydrologic Data:

Nearest pertinent gaging station: At Grand Forks, North Dakota

Gaging station operated by: U.S. Geological Survey

Drainage area at gaging station: 30,100 square miles including 3,800 square miles in closed basins.

Period of record: 1882 to present

Average discharge in record period: 2,306 cfs.

Maximum discharge in record period: 80,000 cfs.

Minimum discharge in record period: 2.4 cfs.

Remarks: Flow regulated by lakes and reservoirs on tributaries. Minimum discharge occasioned by unusual regulation during repairs on dam at Grand Forks.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	–	.35
	Na	–	26
	K	–	7.3
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	–	13
	Cd	–	4
	As	–	*10
	B	–	95
	P	–	95
	Fe	–	25
	Mo	–	63
	Mn	–	8.4
	Al	–	32
	Be	–	*.11
	Cu	–	11
	Ag	–	*1.1
	Ni	–	*4
	Co	–	*4
	Pb	–	21
	Cr	–	*11
	V	–	*21
	Ba	–	61
	Sr	–	113

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	–	–	April to June	–	–
January to March	–	–	July to September	11.3	.7

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE NORTH DAKOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RED RIVER OF THE NORTH

STATION LOCATION RED RIVER AT
GRAND FORKS, NORTH DAKOTA 69

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						DATE OF DETERMINATION		GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO.	DAY	YR.	MO.	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO.	DAY	pc/g	±	pc/g	±
11	19	62	12	31	-	-	-	-	-	-	1	3	32	4	34	5						
12	18	62	1	7	0	0	0	1	0	1	0	3	25	4	25	5						
1	15	63	2	26	0	1	2	3	2	3	12	13	25	18	37	22						
5	29	63	6	19*	1	1	3	3	4	3	19	12	82	17	101	21						
6	19	63	7	31*	13	6	3	2	16	6	146	23	154	18	300	29						
7	31	63	9	9*	1	1	2	2	3	2	11	3	77	8	88	9						
8	28	63	10	1*	1	1	1	2	2	2	9	3	70	10	79	10						
9	26	63	10	31*	0	1	0	2	0	2	13	12	37	15	50	19						

PLANKTON POPULATION

STATE NORTH DAKOTA
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN RED RIVER OF THE NORTH
STATION LOCATION RED RIVER AT
GRAND FORKS, NORTH DAKOTA 069

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA (Number per ml.)	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH				PROTOZOA (Identifiable) Number per ml.	ROTIFERS										CRUSTACEA								NEMATODES (Identifiable) Number per liter	OTHER ANIMAL FORMS (Number per liter)
														NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes) 1ST		2ND		3RD		4TH		5TH		NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes) 1ST		2ND		3RD			
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT				GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		
5	9	63	56	34	82	28	58	16	92	8	14	40	0	87	21	3	11	3	2	2	17	1			22	76	3	50	1			0	1
5	22	63	82	71	89	7	26	7	83	5	10	-	-	-											-							-	-
6	5	63	80	47	83	13	47	7	92	5	28	-	-	-											-							-	-
6	19	63										-	-	-											-							-	-
6	26	63										-	-	-											-							-	-
8	7	63										-	-	-											-							-	-
8	21	63										-	-	-											-							-	-
9	4	63										-	-	-											-							-	-
9	18	63										-	-	-											-							-	-

PLANKTON POPULATION

STATE NORTH DAKOTA
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN RED RIVER OF THE NORTH
STATION LOCATION RED RIVER AT
GRAND FORKS, NORTH DAKOTA 69

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
5	9	63	2270	130	80	2080	80	420	0	15990	3840	6160	930	71	7	92	4	69	4	38	3	77	3	88	2	51	2	24	2	89	1	30	1
5	22	63	11600	90	200	5850	0	1120	40	3150	1300	16500	2400	24	5	71	5	92	3	65	3	25	2	38	2	26	1	68	1	52	1	17	1
6	5	63	1600	0	0	370	0	70	0	770	350	530	660	71	3	24	1																
6	19	63	1700	0	0	110	0	70	0	1110	450	320	200																				
6	26	63	2200	20	0	350	0	150	180	920	590	680	330	32	1	30	1	51	1														
3	7	63	700	20	0	100	20	250	80	150	60	60	0	57	1																		
8	21	63	2500	0	0	210	0	410	1470	60	330	0	100	65	4	51	1																
9	4	63	5200	130	0	2760	0	450	20	1480	240	1680	450	38	3	34	2	24	2	51	1	57	1	25	1	29	1						
9	18	63	2700	70	70	970	0	140	0	990	430	4910	180	38	2																		

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE NORTH DAKOTA

MAJOR BASIN UPPER MISSISSIPPI RIVER

MINOR BASIN RED RIVER OF THE NORTH

STATION LOCATION RED RIVER AT GRAND FORKS, NORTH DAKOTA 69

DATE OF SAMPLE BEGINNING MONTH	BEGINNING DAY	BEGINNING YEAR	END MONTH	END DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	EXTRACTABLES CHLORO-FORM	EXTRACTABLES ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	CHLOROFORM EXTRACTABLES WATER SOLUBLES	NEUTRALS TOTAL	NEUTRALS ALIPHATICS	NEUTRALS AROMATICS	NEUTRALS OXYGEN-ATED COMPOUNDS	NEUTRALS LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
6	5	63	6	13	5332	72	27	45	1	8	9	1	1	7	0	3	2	1	3
7	3	63	7	11	5243	143	61	82	3	19	12	1	1	9	1	6	7	2	12
8	7	63	8	15	4965	163	66	97	2	21	14	1	1	12	0	7	7	1	14
9	5	63	9	15	5076	145	44	101	1	12	16	0	1	14	1	5	3	1	6

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE NORTH DAKOTA
MAJOR BASIN UPPER MISSISSIPPI RIVER
MINOR BASIN RED RIVER OF THE NORTH
STATION LOCATION RED RIVER AT
GRAND FORKS, NORTH DAKOTA 69

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
5	15	63	-	-	-	-	-	-	-	-	19	250	330	15	*25	125	•2	440	-
5	22	63	12•5	10•2	8•5	4•3	44	2•9	10•6	-	15	260	320	5	*25	122	•1	450	-
5	29	63	16•1	8•5	8•5	3•1	47	3•7	-	-	20	230	320	20	*25	130	•0	450	170
6	5	63	21•6	4•2	8•0	2•1	59	6•8	16•0	-	11	198	270	50	270	108	•0	400	-
6	12	63	20•0	4•8	8•0	2•3	67	4•8	15•0	-	8	194	300	40	*25	130	•1	420	10
6	19	63	19•4	5•2	7•7	2•2	66	5•0	17•0	-	15	176	290	40	350	125	•1	390	5300
6	26	63	22•7	4•8	7•8	1•9	49	5•0	16•6	-	-	-	-	-	-	-	-	-	960
7	3	63	23•7	5•1	8•0	1•1	45	4•8	-	-	-	-	-	-	-	-	-	-	10
7	10	63	26•7	5•2	9•0	-	65	4•2	12•8	-	-	-	-	-	-	-	-	-	10
7	24	63	26•2	5•0	8•1	•7	43	4•6	14•2	-	19	250	380	30	*25	142	•3	500	1000
7	31	63	25•2	5•8	8•2	1•0	42	4•0	12•4	-	24	220	350	20	*25	115	•2	430	200
8	5	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50
8	7	63	24•8	7•0	9•2	1•2	42	3•9	11•0	-	20	230	310	15	*25	98	•4	420	-
8	14	63	20•7	6•9	8•2	1•4	41	3•0	10•6	-	20	230	320	10	*25	90	•2	390	-
8	21	63	22•2	6•6	8•1	2•4	40	3•9	10•8	-	16	174	240	5	*25	105	•3	360	250
8	28	63	22•2	6•8	8•4	-	38	3•9	10•4	-	13	194	270	10	*25	100	•2	370	200
9	4	63	20•0	6•9	8•7	2•9	42	3•9	11•0	-	18	210	330	10	*25	100	•3	380	-
9	11	63	21•2	4•8	8•7	2•3	39	4•0	11•0	-	14	220	290	20	*25	98	•3	390	300
9	18	63	17•3	5•2	8•7	1•9	44	4•4	11•0	-	14	230	300	30	*25	118	•2	420	110
9	25	63	15•7	4•3	8•6	1•8	42	4•4	12•6	-	20	250	330	25	*25	115	•3	530	130

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Grand Forks, North Dakota
Operated by U.S. Geological Survey

STATE: North Dakota

MAJOR BASIN: Upper Mississippi River

MINOR BASIN: Red River of the North

STATION LOCATION: Red River at Grand Forks, North Dakota

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	2.640	2.140	2.500	1.500	1.050	1.200	6.070	3.470	5.200	3.670	1.120	1.190
2	2.560	2.170	2.390	1.450	1.050	1.200	6.190	3.430	5.530	3.470	1.170	1.220
3	2.470	2.180	2.320	1.450	1.050	1.250	5.800	3.380	5.800	3.280	1.180	1.280
4	2.470	2.220	2.290	1.500	1.050	1.250	5.610	3.340	6.290	3.110	1.220	1.310
5	2.460	2.200	2.260	1.500	1.050	1.200	5.810	3.240	6.940	2.980	1.270	1.300
6	2.440	2.200	1.770	1.500	1.050	1.200	5.620	3.190	7.260	2.830	1.250	1.280
7	2.420	2.260	1.200	1.550	1.100	1.200	6.250	3.140	7.550	2.700	1.180	1.270
8	2.420	2.150	1.250	1.550	1.100	1.250	8.500	3.090	7.650	2.580	1.100	1.240
9	2.440	1.950	1.400	1.500	1.150	1.250	10.100	3.040	7.630	2.440	1.040	1.250
10	2.480	1.690	1.400	1.450	1.150	1.250	11.000	3.020	7.390	2.300	.983	1.220
11	2.500	1.700	1.400	1.450	1.150	1.250	10.700	2.980	7.210	2.280	.947	1.200
12	2.520	1.940	1.200	1.400	1.150	1.300	8.850	2.960	7.080	2.680	.939	1.200
13	2.520	2.100	1.200	1.300	1.150	1.300	7.300	2.980	7.060	3.060	.967	1.160
14	2.520	2.180	1.400	1.300	1.150	1.300	6.300	2.980	7.230	4.170	.991	1.120
15	2.520	2.280	1.650	1.200	1.150	1.300	5.600	2.960	7.320	4.110	1.100	1.090
16	2.510	2.340	1.750	1.200	1.150	1.400	5.120	2.970	7.320	3.410	1.190	1.080
17	2.510	2.350	1.800	1.150	1.150	1.500	4.900	2.990	7.400	3.030	1.180	1.010
18	2.500	2.360	1.850	1.150	1.150	1.450	4.760	3.060	7.400	2.650	1.150	.999
19	2.480	2.320	1.850	1.150	1.150	1.450	4.760	3.060	7.110	2.350	1.090	.995
20	2.440	2.320	1.800	1.150	1.200	1.450	4.770	3.170	6.540	2.150	1.070	1.000
21	2.420	2.360	1.800	1.150	1.150	1.450	4.640	3.260	5.900	2.000	1.050	1.040
22	2.420	2.140	1.700	1.150	1.150	1.450	4.430	3.290	5.310	1.850	1.030	1.090
23	2.370	1.830	1.700	1.150	1.100	1.500	4.220	3.290	4.890	1.710	1.010	1.110
24	2.300	1.640	1.700	1.100	1.050	1.650	4.060	3.250	4.540	1.600	.971	1.190
25	2.240	1.500	1.650	1.100	1.150	2.100	3.890	3.200	4.260	1.460	.979	1.250
26	2.200	1.500	1.600	1.050	1.200	3.100	3.750	3.120	4.080	1.350	1.000	1.300
27	2.180	1.880	1.500	1.000	1.200	4.050	3.730	3.050	4.010	1.260	1.020	1.340
28	2.160	2.520	1.500	1.000	1.200	4.750	3.670	2.970	3.910	1.240	1.050	1.360
29	2.150	2.860	1.500	1.000		5.250	3.660	2.920	3.910	1.210	1.060	1.360
30	2.150	2.790	1.500	1.050		5.450	3.580	3.530	3.840	1.180	1.090	1.380
31	2.140		1.500	1.050		5.500		4.600		1.140	1.150	

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